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MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

FEBRUARY 1942

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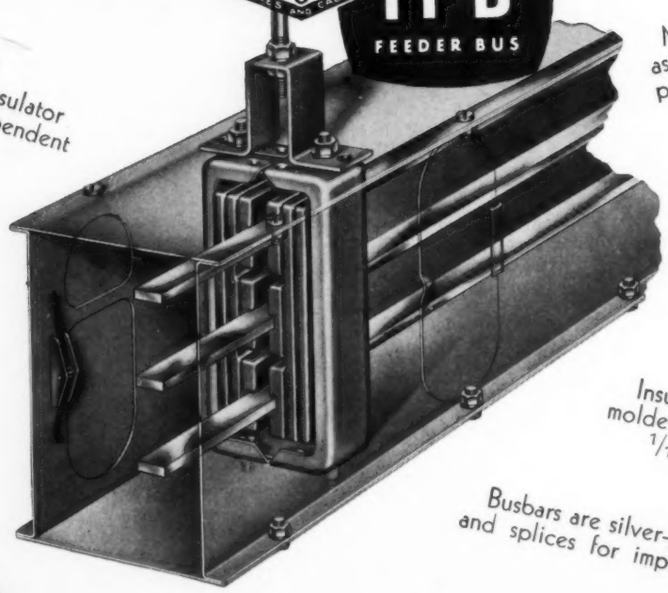

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FACTORY

MANAGEMENT AND MAINTENANCE

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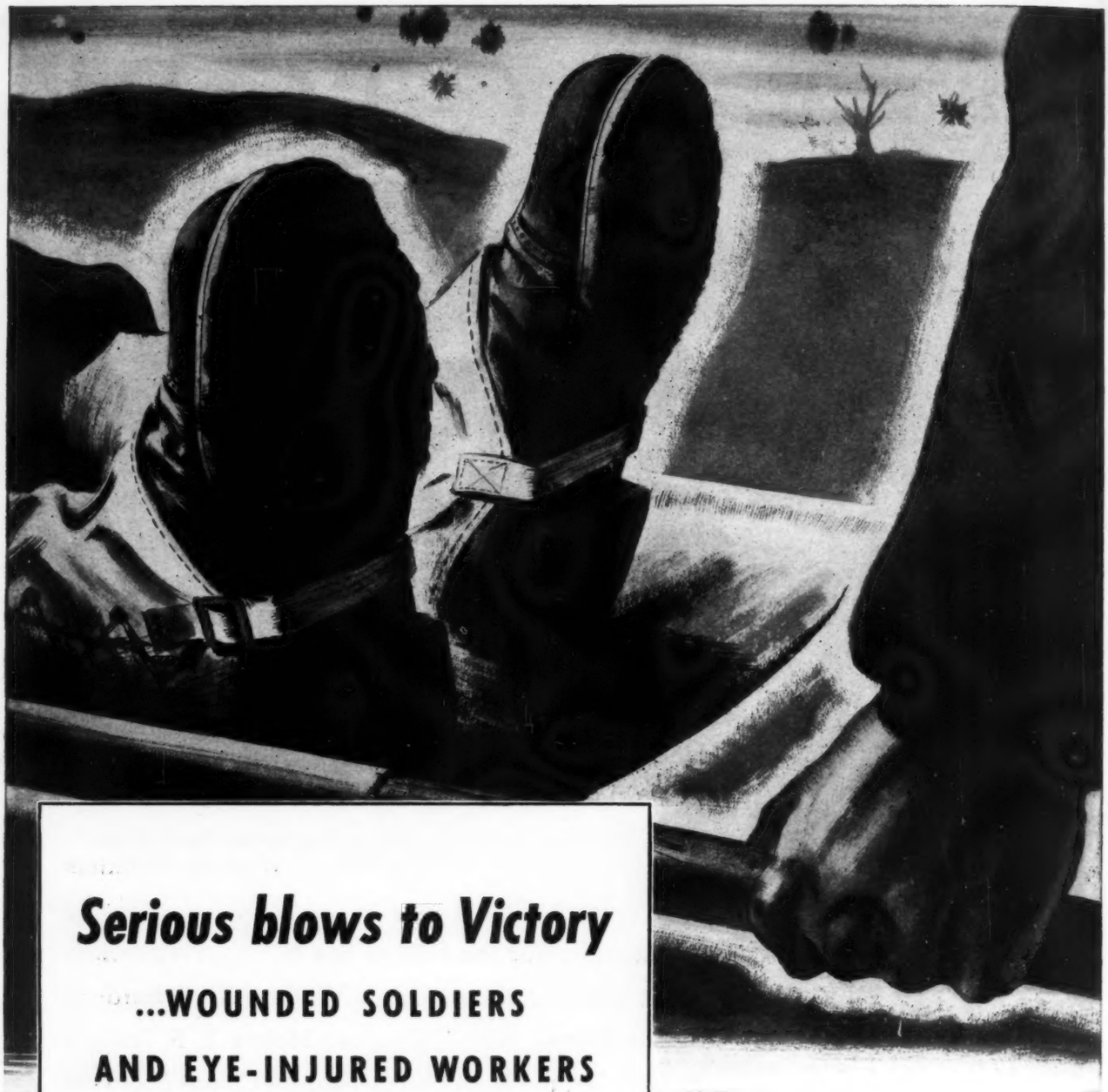

Serious blows to Victory

...WOUNDED SOLDIERS AND EYE-INJURED WORKERS

INDUSTRIAL eye-casualties that take workers—even temporarily—from the battle for the production of war materials, can hurt the cause of Victory as much—*or even more*—than the loss of a soldier or sailor. In 1940 and 1941, nearly 20,000,000 man-hours needed to turn out munitions, ships, tanks and planes were lost by *industrial eye accidents* alone.

Those lost man-hours were lost *forever.* A most terrible tragedy and waste. But the point right now is this: *eye accidents must not happen from now on.* GOGGLES MUST BE WORN. American Optical Company is working day and night to make available to plants throughout the country its line of light, comfortable, safe goggles . . . goggles equipped with Deep-Curved Super Armorplate Lenses for greater resistance to impact.

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FACTORY
MANAGEMENT AND MAINTENANCE
L · C · MORROW · EDITOR

These Things Industry Must Do Now

The past three weeks have demonstrated that there is a new order in the government's part of the nation's biggest job. A single man now has the authority for procurement. A new War Labor Board starts off with a clean slate. A fair and thoroughgoing policy of selective service is in operation.

Here are industry's foremost obligations under the new order. Industry must:

1. Still further increase the rate of production of the implements of war.

2. Carry on the most careful conservation and reclamation of materials.

3. Cooperate fully in the Selective Service.

By a simple Presidential order, serious bottlenecks in procurement have been eliminated. Unless all indications are wrong, from now on plants working on war orders will not be left to wonder when the next order, or letter of intent, or letter of contract, will be issued. The manufacturing industries of the country will be kept busy, and they will know that they may produce as fast as possible without risk of seeing their working forces dissipated by lack of new orders. Donald Nelson, chairman of the War Production Board, Under Secretary of War Patterson, and Under Secretary of Navy Forrestal will, in my judgment, be of a single mind about that.

Next is conservation and reclamation of materials. In view of the magnitude of the production program, it is now much more practical to designate the scarce materials by naming those not yet in that category. They are lumber, glass, ceramics, cement, and some plastics. Conservation can be accomplished by redesign, standardization, simplification, and substitution. Salvage of scrap has gone a long way, but reclamation by that method can be carried much further. Another source for the recovery of material is the obsolete and worn-out stuff that exists in practically every plant—under benches; in machine beds; in stockrooms, toolrooms, storerooms.

The third major obligation listed constitutes a personnel problem. The country has to have men for both its fighting army and its industrial army. In many respects the same people are best for both—the young men from 18 to 27. Many of this age group now are in our most important industries, yet they must go into the Army. Industry, by full cooperation with the Selective Service Board, can and should get deferment for many of these young men, while it trains other people to take their places. But it *must train*—women, older men, partially disabled men and women. General Hershey, I am convinced, understands industry's problem, and will go the full way in cooperation. But he must raise an army.

On the whole, the picture has brightened. The new order should be to industry's liking. The obligations defined here are specific obligations, such as industry likes. They will be met without reservation.

L C Morrow

★ Does the new 18-to-65 registration foretell government control of industry's hiring? By present plans, it's on the way. Our output goals may also bring drafting of women—and management—for 23,500,000 war jobs in industry

Will Conscription for

★ Where is America to get 23,500,000 workers for war jobs? This requirement calls for twice the number employed in peacetime manufacturing. When the war pace hits its peak we shall have to induct women, older men, and handicapped workers for the industrial effort. Management will be no exception. Does this sound incredible? Perhaps, but such radical developments are inevitable in the total warfare of today

MID-FEBRUARY WILL BEGIN the most significant national nose-counting in the history of the United States. With the extension of the national registration to men 18 to 65, will come the prospect of far-reaching war-born changes in the locations, livelihoods, and ultimate destinies of millions of Americans who do not yet suspect its meaning.

By all the signs, the new registration, apart from its military uses, will be the preface to the eventual practical conscription of manpower for production as well as for the armed services. It is likely to presage, also, the conscription of women as well as men. And it is not too soon to consider the conscription *of management as well as of labor*. If the war goes on as expected, we should see these changes taking shape within six months and hardening into complete reality by the end of 1943.

Plans have already been laid for total mobilization of the nation's productive manpower. This may not be compulsory at first. Neither were priorities. And it may not be called "conscription." But it will begin in earnest when the doors of industrial plant employment offices clang shut for the duration of the war and the government takes over private industry's hiring operations. Does this sound like an incredibly radical change from orthodox practice? Perhaps so, but it is scheduled to begin this year. And with the stage thus set, Uncle Sam will then proceed, gradually at first, to move men and women about like checkers on a board just as they are moved today in Germany and in Britain.

The existence of these plans may be officially denied. The plans may change, as to detail, as plans do in Washington. But the pattern of the plans should hold because the procedure, in a modern war situation, is considered inevitable. FACTORY, after interviews with many of the best-informed sources in the capital, reports that the plans, as they stand, call for the following:

1. The centralization of all industrial hiring functions in the United States Employment Service (USES) with which will be integrated the work of all the various training and placement agencies of the government, such as Training-Within-Industry, the CCC, NYA, WPA labor section, Federal Committee on Apprenticeship, and so forth.

2. The close coordination of USES with Selective Service (a) to protect labor supplies in areas where needed, (b) to facilitate movements of priorities-displaced workers to defense areas (this with a background of "work or fight" compulsion).

3. The registration and eventual drafting of women for war work. Women were definitely scheduled for inclusion in the coming registration. At the last minute the plan was changed for "public relations reasons."

War Work Come?

Ewing Galloway

4. The "drafting"—compulsory or otherwise—of engineers, technicians, specialists, administrators, and management men of all sorts. To this end a national inventory of special abilities is already well under way.

On the face of it we have little choice. We will build, by the end of 1943, an armed force of perhaps 6,000,000 backed by an industrial army *on war work alone* of 23,500,000, more than double the average employment in all the manufacturing industries. To do this and maintain the most essential civilian supplies and services will stretch to the breaking point the nation's "total labor force" of 55,000,000.

This "total labor force," remember, includes storekeepers, housemaids, dog catchers, chefs, glamour girls, executives, and anyone else who is considered *able* to earn his living. From this 55,000,000 subtract 6,000,000 of our youngest men and 23,500,000 of our ablest workers, and you have 25,500,000 remaining. From this subtract 10,500,000 for agricultural labor; 4,000,000 for essential manufactures; 4,000,000 for trade, distribution, and finance; 2,500,000 for government service; 4,000,000 for the service industries; 1,500,000 for transportation; 1,000,000 for construction, 1,000,000 for utilities; 300,00 for mining to supply civilian needs; and 600,000 for miscellaneous occupations. All these, by the way, are *minimum* estimates, and most of them, except agriculture and government, represent reductions of 50 percent from 1940 averages.

When these deductions are completed, you are faced with a deficit of nearly 4,000,000 workers. What then? Housewives become trolley conductors, as they have in England where the conscription of feminine labor prevails. In a word, you regulate your labor supply systematically and draw upon exceptional reserves by combined resort to patriotism, priorities, and compulsion. The greater the need, the greater the degree of coercion. That is one of the imperatives of "a hard

Women are now being used on 30-odd production jobs at Vultee Aircraft, including upper-bracket tasks like welding, precision inspection, and turret-lathe operation. Men have been upgraded from these jobs into work calling for higher skills

BEGIN NOW TO TRAIN WOMEN AND OLDER

BRIG. GEN. LEWIS B. HERSHEY, *Director, Selective Service System*

I welcome this opportunity to emphasize to industrial management the points that I believe to be vital concerning the coming effect on industry's personnel policies of national mobilization through Selective Service.

One warning should be stressed above all others. It is this: Begin *now* to train older men, handicapped people, and women. Train them for every sort of work for which you may find them adaptable.

Bear in mind that the actual combat services sooner or later may claim all able-bodied men from 20 to 27 and many men above that age, while nearly all men up to 35 will be called for some form of service. Even the aircraft plants, the shipyards, and other key war industries must reconcile themselves to this fact.

I am, believe me, keenly conscious that industrial production for war must not be hindered, but I believe we must plan to get that production with the personnel remaining available to us behind the lines after the needs of the combat services are met. We will have no blanket preferences for whole industries or companies. We will have no blanket exemptions. We will have only deferments, and those only for a limited number of specialists.

Employers must be honest and sincere in their requests for deferments, and must limit such requests to men who are in fact necessary. Management and industry must also recognize that the man who is deferred as necessary now is deferred temporarily,

war, a long war, a bloody war, a costly war." And that is the price we shall probably have to pay to reach our goal, at the end of 1943, of 185,000 planes, 120,000 tanks, 55,000 anti-aircraft guns, and 18,000,000 dead tons of shipping.

Similarly it would seem that you cannot treble the tasks of the nation's already over-extended technical and industrial management staffs without snapping what may well prove to be the shortest string in your bow. In that case again—since managerial skills are the hardest to multiply quickly—you manipulate and you conserve. You coax a capable production man out of a B-3 industry into an A-1-a industry, or into the Army, as the case may be, and if you can't coax him you find some way to snatch him. Still short of managerial manpower, you begin to reach into the back shelves. You cast around for engineers who were graduated 10 years ago and haven't practiced since. You give them refresher courses and put them to work.

If you lack the legal authority to do these things, you go to the proper place and get it. England's Regulation 58a, issued under the Emergency Powers Defense Act, grants the Minister of Labour full power "to direct any person in the United Kingdom to perform such services as the Minister thinks he is capable of performing." That's plain enough, and in practice it means that, as Beverly Baxter, M.P., put it in "British Industry in War," (FACTORY, November 1941): "If Henry Ford turned up at the Chrysler plant and said he had been put in charge by President Roosevelt, one might have something of an American parallel."

Can Also Take Away

Moreover, under the "Essential Work Order," the Minister of Labour assigns employees to plants designated on his "schedule of undertakings" or list of essential industries. Between the lines is a hint that what the Minister can give, in the way of labor priorities, he can also take away. "Normal" wages and working conditions are specified in the terms under which the worker is placed. The employee can't quit and his employer can't fire him without notice to the Minister and there is also an Appeal Board to hear disputes. And note this comment by a British official: "Managerial personnel is controlled as closely in these (essential) industries as is labor."

This precedent deserves the American reader's close attention because Washington's plans for manpower mobilization are said to be based very largely on British experience. England began the war with a strong national employment service ("no work, no dole"), and we are building the same thing now.

The United States Employment Service was completely federalized last December. Its 1,500 offices and 22,000 employees, many of whom were formerly on state payrolls, were quickly taken under the federal banner. A big reorganization job was begun by its new Director, youthful John J. Corson, a crack personnel man from the Social Security Board. When set up to handle its huge new tasks, USES will probably need another 22,000 employees, many of whom will be drawn from the very plant employment offices that it is expected eventually to replace.

USES will remain an operating, not a policy-making, agency in the set-up by which it will be integrated with other placement and training groups. There has been talk that a cabinet officer will head the entire program. For the present, policy rests with the National Labor Supply Policy Committee, originally created in the Labor Division of OPM, and with Lt. Col. Frank J. McSherry, Sidney Hillman's Deputy Director for Labor Supply and Training. This committee includes six members each from management and from labor with Arthur F. Flemming of the Civil Service Commission as Chairman.*

The National Labor Supply Policy Committee had a hand in framing the occupational questions in the new national registration questionnaire. The questions are aimed to achieve a 70-percent-accurate preliminary screening of men with special abilities and seek to elicit information about both primary and secondary skills. Some 150 specially needed skills are listed.

Duplicate copies of the questionnaire will be studied by the local Selective Service Boards and the local USES offices who will share the services of an occupational adviser. Both agencies will be on the lookout for hoarding by employers of skilled labor and will seek to force upgrading and replacement training to overcome it. Eventually employers may be required to submit their payrolls for inspection.

It is estimated that it will take at least six months for USES to organize sufficiently even to begin in its big task of taking control of the labor market. But before then it is expected to operate in the critical areas, an example of which would be Detroit. Depending on the success of the automobile-plant conversion program, there may still be many workers who will have to be moved to areas where

* Creation of the War Production Board should strengthen the hands of the Committee and of Colonel McSherry. Whereas legislation might have been needed to implement the program, it is probable that an executive order can now turn the trick. An unknown factor is the rumored Manpower Allocations Board, the appointment of which has been studied by President Roosevelt. There is much to be said for allocations as a long-range expedient. This is one point on which the British have apparently failed. For failure to apportion their labor supply correctly in advance, they have met with some embarrassing reversals, such as the necessity for recalling a large corps of coal miners from the armed services.

PEOPLE

and each employer has the responsibility to secure and train replacements for such deferred men who are physically fit and would otherwise be available for military service.

Generally speaking, I doubt that the gigantic claims upon the nation's manpower which the size of our program will make, have been fully grasped, even by industrial management. So I repeat: ***Prepare now to build for the near future a working force of those whose services are not needed or cannot be used at the front.***

Editor's Note—General Hershey's statement was prepared exclusively for *Factory* in answer to a single question: "What is your best advice to industrial management on the personnel policies to pursue in regard to men of fighting age?"

they are needed. First, however, every effort will be made to utilize the same employees in the same plant or in the same community and to "convert" the workers themselves, if possible, by training and upgrading.

Moving single workers or large numbers of workers around the country will be undertaken reluctantly, USES officials say. Yet Hillman himself has hinted that as many as 2,000,000 or even 3,000,000 priorities-displaced workers and their families may have to be shifted during 1942. The practical obstacles to large-scale moves, such as wage differentials, differences in working conditions, differences in union memberships, and so forth, remain to be worked out. About only one thing seems certain. The government will protect the worker from financial loss in the transaction.

Control of Labor Market

The acuteness of the coming labor shortages and the speed with which they develop, will doubtless determine the degree and speed with which the government asserts its control over the labor market. On the one hand, a shortage might make it less, rather than more, necessary for the government to force employers to accept older workers, women, negroes, and properly registered aliens. On the other hand, a shortage might make it more, rather than less, necessary for the government to restrict the individual worker's movements from job to job or from place to place.

As for the worker who balks at being moved, let us say, from Detroit, where he isn't needed, to Texas, where he is, the fact that Uncle Sam is doing all the hiring in both places would eventually constitute a fairly cogent compulsion. There remains also the "work or fight" factor which cooperation between USES and Selective Service implies. This will grow in importance if, as has been hinted, Uncle Sam begins to call up married men for military service with "dependency allowances" to soldiers' wives.

Will the coming stringency of manpower mobilization arouse much opposition? Probably not, for this is war. At any other time organized labor might be expected to join employers in a fight against such severe infringements of personal liberty. In fact the CIO has, in peacetime, opposed such plans on the ground that government control of employment means wage control. This, by the way, seems a not unlikely prospect. To the degree that it restricts competitive hiring and labor "pirating," it will tend to hold wages down. Apparently neither the CIO nor AFL has given much thought to the labor mobilization problem in their public conferences. Off the record both have indicated that, while not openly endorsing the plan, they will be willing, for patriotic reasons, to go along.

It is noteworthy that a recent Gallup poll found 67 percent of Americans, including workers, of course, quite willing to let the government tell the worker "what job, where, and how much." Such opposition as there might be, would also diminish further with a heightened war psychology. This was true in England where the workers themselves welcomed practical labor conscription as a means of systematizing their assignments to jobs where they could serve best. English women accepted the labor draft with equal grace, when their turn came. Today in England 75 percent of aircraft workers and 30 percent of those in heavy manufacturing are women.

In any discussion of the prospect for management mobilization or conscription, the same factors which govern labor control—urgency, shortage, public reaction, and war enthusiasm—should be taken into account.

Is there a shortage of trained management? It hardly seems necessary to debate the question. Only last month the Washington Navy Yard was compelled to advertise for women engineers, technicians, and draftsmen.

Will the shortage grow more acute? The mere size of our production program answers that. Shipbuilding alone will create 60,000 more supervisory jobs in the next two years.

A Management Draft?

Has there in the past been serious talk in government circles of a wartime management draft? Yes, bills have appeared in Congress from time to time and one once passed the House. Moreover, the Industrial Mobilization Plan of 1936 contained the sample draft of a bill to be called "The Industrial Management Act" which was intended for passage in time of war. In effect its provisions are much like those of the British law empowering the Labour Minister to "direct any person . . . to perform such services as the Minister thinks he is capable of performing." The Industrial Management Act, furthermore, would have provided penalties and even im-

FACTORS THAT MAY FORCE CONSCRIPTION OF WAR WORKERS

1. **The national labor force totals 55,000,000**
2. **From this number subtract 6,000,000, the probable size of the armed forces by the end of 1943**
3. **There are 49,000,000 left. From this number subtract 23,500,000 industrial workers on war jobs alone (estimated total needed for Victory program at end of 1943)**
4. **There remain 25,500,000 for agriculture and essential civilian production and services**
5. **Actually, at minimum estimates, we shall need 29,400,000 people to keep the farms and railroads running and to make and market our necessities**
6. **At the least, therefore, we face a manpower deficit of 3,900,000 persons**
7. **This means not only the employment of many women, handicapped persons, and older people who would not ordinarily be called on to work. It means also the regulated supply of manpower, by conscription and priorities**

"PREPARE NOW," urges General Hershey, "to build for the near future a working force composed of those whose services are not needed and cannot be used at the front." Training programs in industry have gained great momentum during the past year. They must now be accelerated through the use of every available technique. Here, for example, is one that is being used with great success at Caterpillar Tractor Company to speed the training of welders. A transmitter is installed in the instructor's helmet, a receiver in the learner's. The one-way telephone permits the instructor to point out the learner's possible mistakes and discuss problems as they occur under actual welding conditions.

prisonment for management men who refused to accept government assignments. (See "Industry and the Next War," FACTORY, May, 1938.)

Thus we see that management conscription did have a definite place in the peacetime thinking of those who planned for war. This is quite apart, incidentally, from Section 120 of the National Defense Act and Section 9 of the Selective Service Act under which the government is empowered to take over operation of seized plants (as at Federal Shipyards, North American Aviation, and Air Associates) and with it control of the managements.

Yet FACTORY's recent inquiries among prominent War Department, defense, and Selective Service officials in Washington revealed a frequent tendency to discount the possibility of management conscription.

"You can't draft officers," one man of national note declared.

"Don't forget," said another, "that the Industrial Management Act was dropped out of the Industrial Mobilization Plan in the 1939 revision. I think personally that it was put there in the first place only as a result of the

Nye Committee investigations. I don't think it was really any part of the War Department's thinking at the time. You must bear in mind, too, that Nye wasn't thinking so much of planning for war as of making war so tough that nobody would want to get into it."

"Knudsen wasn't drafted," said yet another, almost indignantly rejecting the whole idea. In all candor it must be added that there does not appear to be, at this time, the slightest sentiment in Congress in behalf of such a move. The question didn't even come up in the hearings on the recent amendments to the Selective Service Act.

But We May Come To It

On the basis of this evidence alone it would be possible for FACTORY to predict categorically that there is no likelihood whatever of a management draft. But let's look a little further.

"I think we may have to come to it," said a high War Department procurement official. "Already the Army and Navy Munitions Board has named a special committee to coordinate requirements on management, regionally and in the companies themselves, because of the shortage that exists. I don't like to talk about drafting, so let's say that we may be near the time when systematic *assignment* of management manpower may be necessary."

"Labor will comply willingly with government control of labor supply," said a national trade union spokesman, "but it would certainly expect management to take the same dose."

And finally:

"You don't telegraph punches like that," said a key defense official. "The question won't come up in my department and the policy won't be mine to decide. But I can tell you this: If I had in mind any such move as management conscription, I wouldn't say a word about it now."

Is it possible that management conscription is being soft-pedaled as an issue at present "for public relations reasons?" It is definitely *not* a forgotten question in the councils of those who, under the new War Production Board set-up, will have the responsibility of staffing the government agencies for the tremendous production job ahead.

"When you hear it discussed," said a man fairly close to these councils, "it is phrased something like this: If we can't get the men we want on a voluntary basis, we shall have to put it on an 'or else' basis."

Knudsen wasn't drafted, to be sure. But it is not the independently wealthy man who constitutes the personnel problem that lies ahead. It is the middle-bracket management man, the one to whom a shift to the government's service (or later on, a shift from plant to plant at the government's behest) may mean a serious professional and financial sacrifice.

"You can take a $15,000 man and put him in a major's uniform at about $4,600 a year and you'll be surprised how well it works," said yet another official. This is noteworthy because of the known intention of Donald M. Nelson, new defense czar, to make infiltration of the armed services with key personnel from industry a major point in his reorganization of the defense set-up.

Assume, for a moment, that plans are definitely afoot for the systematic mobilization, by conscription if necessary, of management. The problem arises: Where and how are you going to *find* the men you want? The new national registration questionnaire will not be sufficiently detailed to provide an inventory of management skills, although it is expected to turn up some much-needed technicians and draftsmen. What you need then is a register of all experienced men with detailed information on unusual specialties and abilities. This could be gotten by means of a separate registration, which, incidentally, was discussed in the 1936 Industrial Mobilization Plan.

If You Are An Engineer

Or it could be done by some government agency. As a matter of fact, *it is being done* already—on a quite large scale. The little-publicized National Roster of Scientific and Specialized Personnel (call it the Roster for short) has now been in existence for over 18 months. It is jointly sponsored by the United States Civil Service Commission and the National Resources Planning Board. Its staff shares offices with the Civil Service Commission and is headed by Dr. Leonard Carmichael, president of Tufts College.

If you are an engineer, a scientist, a foreign-language expert, a geographer, a personnel expert, a top production man, or a recent technical college graduate, you may already have received a very exhaustive questionnaire from the Roster. This, quite possibly, was sent to you through the engineering or alumni society to which you belong. You are one of 402,000 men who have so far received such questionnaires. If you returned it, you are one of 221,000 men whose names and specialties are carefully cross-indexed in the Roster in a list of 758,000 abilities in 51 different fields. Your questionnaire, incidentally, carries with it Civil Service certification—to cut red tape—for the job which you may some day be unexpectedly called to fill. The Roster has already filled thousands of government jobs and has, on occasion, helped privately operated defense industries to find large groups of management specialists.

Its Primary Purpose

The Roster unquestionably provides the basis for management mobilization. Some of its own staff members consider this its primary purpose.

Thus unfolds the probable pattern by which the United States, a democracy, will marshal the manpower it needs for the gigantic war effort that has already been announced. To management, to labor, and to the individual it means severe restrictions of personal freedom as it has in England, another democracy at war. The new regulations of manpower will be achieved in part by an appeal to voluntary patriotism and in part to compulsion where needed.

FACTORY has sought in this report to bring to management the best available information on the specific ways in which the mobilization of our manpower will be achieved. Within the framework of the plans outlined, changes as to detail may take place. If we fall down on our production schedules, the plan may not materialize so soon. On the other hand, vast output and a tighter labor market may hasten it. In all you have read, remember that FACTORY is visualizing *the events of the next two years in a long, hard, intensified war. If* the war goes on that way, then the indicated events will occur in substantially the way in which they are depicted here. On that, FACTORY's sources all agree.

Room for All to Park

With an estimated 9,000 miles of tire mileage in the average car, wage earners will still be driving to work in the months just ahead. Hence this timely story of how a plant with large volume of war orders took care of its parking problem

OF ALL THE LESSER PROBLEMS besetting the managements of factories located in heavily built-up areas, probably none is more persistently annoying than the parking of employees' cars. A responsibility that some factory owners evade, these cars, when left out on the streets, are a source of irritation to neighboring property owners, a hazard to motorists and pedestrians, and a dangerous fire hazard to the factory itself.

Probably nowhere was there a more crying need for solution to this particular teaser than at the Zenith Radio Corporation in Chicago. With some 400 office and 3,000 factory employees in the same plant, parking spaces were at a premium. And, as the company continued to expand, the adjoining residential streets became increasingly jammed with parked cars.

No More Street Parking

Rather than ignore the protests that filtered in, the Zenith management faced the issue squarely, with the net result that the streets are now completely cleared of parked cars, and everybody concerned is well satisfied.

First of all there was the problem of space. Some empty lots were available, but they were sandwiched between those with homes on them. Not to be deterred, however, the management finally procured the use of fourteen adjoining lots, four of which held buildings.

The work of wrecking three of these houses and moving the fourth a half block to a new location, attracted the interested attention of numerous Zenith employees during their lunch hours.

It was during this time that the only complaints against the project were received, and they came from Zenith employees themselves. Several of these critical "sidewalk superintendents" were heard to complain loudly that the management lacked foresight, because they failed to place comfortable benches from which to view (and boss) the demolition work. The least that could have been done, they argued, would have been to provide some shade to stand in.

Failing to get a rise from good-natured Doc Price, Zenith's No. 1 maintenance superintendent, the boys turned their jibes on some eight or ten of their own buddies who were working on the job. They got short shrift from these fellows, however, and when one threatened to tickle the chin of a particularly loud-mouthed critic with a 6-ft. wrecking bar, they all conservatively decided that lunch hour was up and hastily departed for Zenith's friendly, protecting walls.

With the houses down, the lots were ready to be filled and leveled. Here Doc Price saved Zenith a sizable amount of money by finding a contractor who was already engaged in tearing up some of the city's streets.

Usually having to pay for a place to unload his trucks, the contractor was glad to find a spot where he could dump free of charge. He even sent over one of his big bulldozers to do the leveling and grading.

With trucks hauling almost daily for over a week, the bulldozer charged back and forth across the lots, snorting and chugging as it plowed through piles of debris and nudged huge slabs of concrete into the gaping holes of what had formerly been basements.

Next, over 1,000 yards of cinders were brought in, leveled off, and packed down. While this was going on, posts that had been bought second-hand had the lower portions treated liberally with asphaltum paint to prevent rot and were then sunk deep in the ground. The tops were cut to a bevel, heavy planks bolted on, several coats of grey paint applied, and the result was a husky, attractive bumper fence that promises to defy even the most feminine driver.

In the special lot that is reserved for officials, numbers are painted on the fences. In the other, stout steel cables are stretched across the lot to divide it, and stalls are marked off by metal flags attached to the cable. The flags are laid out on 8-ft. centers, which allows 2 feet on each side of the cars. No excuse for scraped fenders.

In three weeks, parking facilities were increased to take care of well over 600 automobiles, and all Zenith cars were off the street. Now there is no more trouble from the incidental

(Continued on page 182)

All Zenith cars are off the street. No more damage to cars by school children, no more complaints from the neighbors, minimized traffic hazards, and plenty of room for fire equipment should the need arise

What is waste in one plant may be raw material in another. Erie is making use of every bit

Erie Gets In the Scrap

Salvage campaign in Erie plants is ferreting out tons and tons of scrap material, finding new uses and new markets, getting precious metals back into production

DURING THE FIRST TWO WEEKS of a drive to reclaim and salvage every bit of waste material, Erie, Pa., manufacturers amazed themselves by uncovering 2,292 tons of scrap steel alone. So successful has this campaign been from its very inception that FACTORY hastens to pass along to plant operating men in other industrial communities the story of a salvage plan in which industrialists, engineers, maintenance men, foremen, waste material dealers, and about 40,000 workers cooperated.

It all started with the Manufacturers Association of Erie, which is affiliated with the National Industrial Council, and, through this Council, with the National Association of Manufacturers. Cooperating with the Industrial Salvage Section, the Association created an Executive Steering Committee and an Advisory Committee, representing the leading industrial concerns of the city.

Notices were sent to all industrial organizations about the urgent need for scrap materials of all kinds, especially critical commodities; the necessity for eliminating waste and spoilage in every plant; and the desirability of wrecking obsolete machinery and equipment at once for its scrap content. They were advised to get all the scrap and waste from under benches and out of corners, out of shop yards —wherever it happened to be concealed and forgotten.

After two weeks of preliminaries, reports were analyzed. Results astounded even the most optimistic. During these first two weeks, Erie manufacturers uncovered 2,292 tons of scrap steel alone.

Here are a few significant incidents that occurred during the first stages of the campaign.

A paper manufacturer, by disassembling obsolete machinery, produced hundreds of tons of scrap metal.

A steel foundry, which uses its

scrap right along, found 42 tons in unsuspected corners.

An electrical apparatus plant discovered an accumulation of 282 tons of ferrous metal and 25 tons of non-ferrous scrap.

A small annealing plant produced 3 tons; a brick yard came up with 5 tons; and a general contractor wrecked his obsolete equipment and loaded up some discarded structural steel, for a total score of 40 tons.

A metal working company called a waste material dealer to come and get three discarded machines, which it offered to dispose of for $25. The dealer declined to take them at any price, because he thought it would cost him more to tear the machines down and haul them away than they were worth as junk. The company trouble-shooter was summoned. He requisitioned a few parts, put mechanics on the job, and restored the machines to working order at a total cost of $100. Then he put them back of the production line, where, it is estimated they will pull their weight for five years of full-time operation.

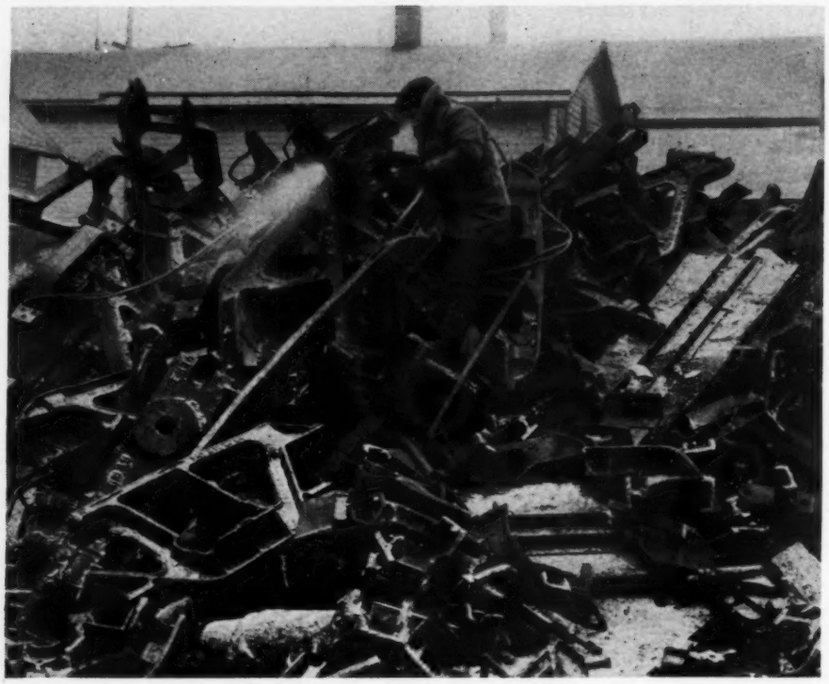
Members of the Manufacturers Association do not hold many meetings. They get things done more by individual effort, telephone consultations, and small get-togethers at lunch time. The Erie method is to find the man who knows all the answers to a particular question, or who knows how to find the answers, and give him the job of solving the problem. In line with this procedure the Executive Steering Committee was composed of men who knew all about some phase of the problem at hand. These men were F. E. Bliven, chairman of the committee, supervisor of salvage, General Electric Company. R. C. McElroy, Secretary, U. S. Metal Products Company, familiar with handling and processing non-ferrous metals; M. F. McCarthy, assistant to the president, Erie Forge & Steel Company, conversant with forge and steel operations; W. E. Little, works manager, Bucyrus-Erie Company, informed on machine shop and foundry work involving heavy products; Alvin Decker secretary-treasurer, Merwin Manufacturing, representing a small general metal working shop; Harry Bole, superintendent, Erie Meter Systems, Inc., and president of the Erie Foremen's Association; and Dana E. Jones, manager, Manufacturers Association.

Improved systems of dealing with salvage and scrap disposal were well under way when representatives of the Bureau of Conservation, OPM, appeared on the scene to find out

Posters to keep the campaign uppermost in everyone's mind, Foremen, workers, all are cooperating in Erie's biggest housecleaning

F. E. Bliven, chairman, Executive Steering Committee, supervisor of salvage, GE's Erie Works

Dana E. Jones, Manufacturers Association manager for 25 years, secretary of Steering Committee



Even the most optimistic were surprised at the amount of waste and scrap that turned up in the first few weeks of the salvage campaign

what was going on in Erie, and to tie up the efforts of the Erie manufacturers with the plans of the national office in Washington.

Members of the Executive Steering Committee and of the Advisory Committee met with the OPM men. Later the foremen were called in to learn more about the program. Then the Steering Committee invited the waste material dealers (heretofore known as junkmen) to hear about the new plans, and to receive their pledge of 100 percent cooperation.

Scrap was defined as material that can be used again; waste as material for which the company has no use—but what is waste in one plant may be raw material in another. When all the uses of scrap were made known, it was surprising how much could be reclaimed, and how little waste material there really was on hand.

The Executive Committee and the Advisory Committee, working together, formulated a program for the drive, made up of the following specific points of attack:

1. Wrecking abandoned and obsolete machinery and equipment;
2. Speeding the return of scrap and waste materials through existing channels to mills and refineries;
3. Utilizing all critical materials to best advantage;
4. Handling and segregating scrap and overage at the source;
5. Avoiding contamination (mixing metals);
6. Re-using, wherever possible, blanks, cut-downs, short ends, clippings, and so on.

They also set up machinery to formulate instructions to salvage managers and waste material dealers, so that there would be no conflict in method; to furnish technical advice regarding proper methods of segregation, collection and disposal, government regulations; list of dealers, brokers, buyers of scrap; information, posters, and other OPM material; enlisting general support for the program; and keeping records.

It was recognized at the outset that no group of workers know as much

(*Continued on page 188*)

Salvage was not a new story at GE Erie Works, which recovered 1,125,000 pounds in one year

Secret in reclamation is sorting at source. Western Electric shops are dotted with marked receptacles

War Metals From Scrap

EFFECTIVE METHODS of conservation have become intensely fascinating to a nation which, in the midst of an unprecedented program of war production, faces a grave shortage of metals and other vital raw materials. Indeed, methods that in more normal days might have been considered uneconomical have suddenly begun to seem distinctly attractive. The simple and obvious reasoning is that all production inevitably depends on the smooth and uninterrupted flow of the raw materials for manufacture; without these raw materials, economy itself becomes a rather fruitless practice.

Industrial engineers have for years been examining the niceties of reclamation and conservation of metals. One of many large concerns that have found it convenient to establish company-owned reclaiming plants is Western Electric Company, whose subsidiary, Nassau Smelting & Refining Company of Tottenville, Staten Island, N. Y., is charged with the reclamation of non-ferrous metals junked by the vast Bell System. A large part of the scrap originating in manufacturing operations is, of course, reclaimed directly at the company's Hawthorne Works brass mill.

Were the junk that Western Electric returned to Tottenville from its manufacturing operations a vast, heterogeneous mass of scrap metal, Nassau would have the prospect of a long and tedious sorting process before any real accomplishment in reclaiming could be undertaken. *The fundamental secret of successful reclamation is identification and segregation of material.* Mixed scrap can be sold only at the value of the lowest grade.

It is obvious, then, as it has been to those in command at Western Electric's manufacturing works, that this sorting should be done at the scrap source—in the shop. Perhaps an examination of Western Electric's handling of nickel-bearing scrap will stimulate ideas of equal value to other manufacturers.

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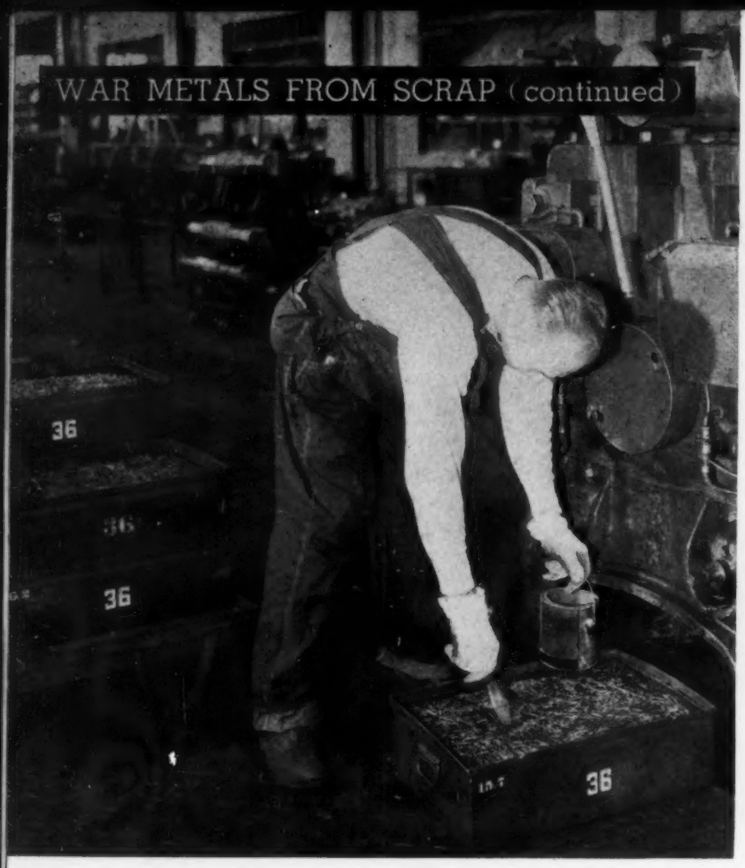
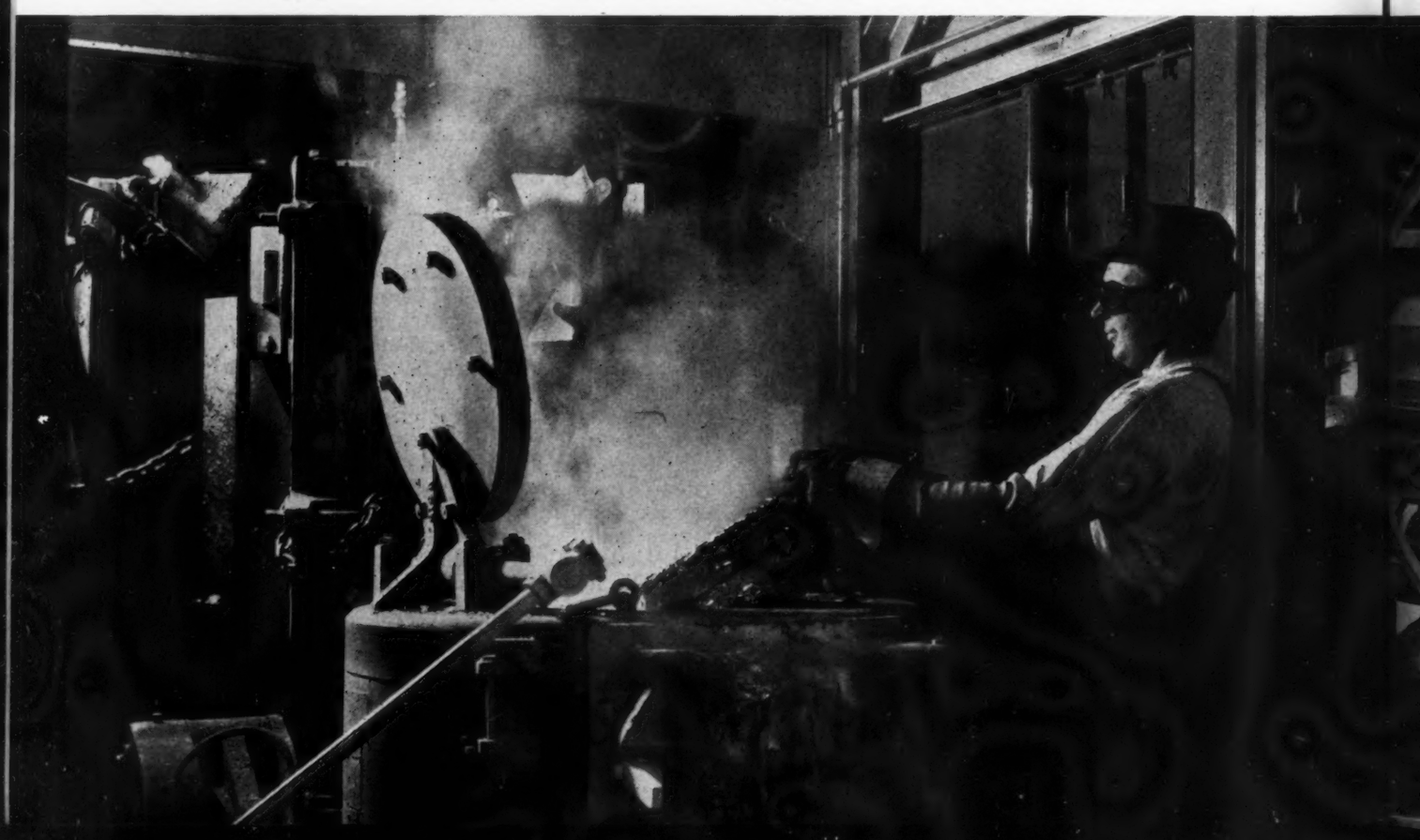
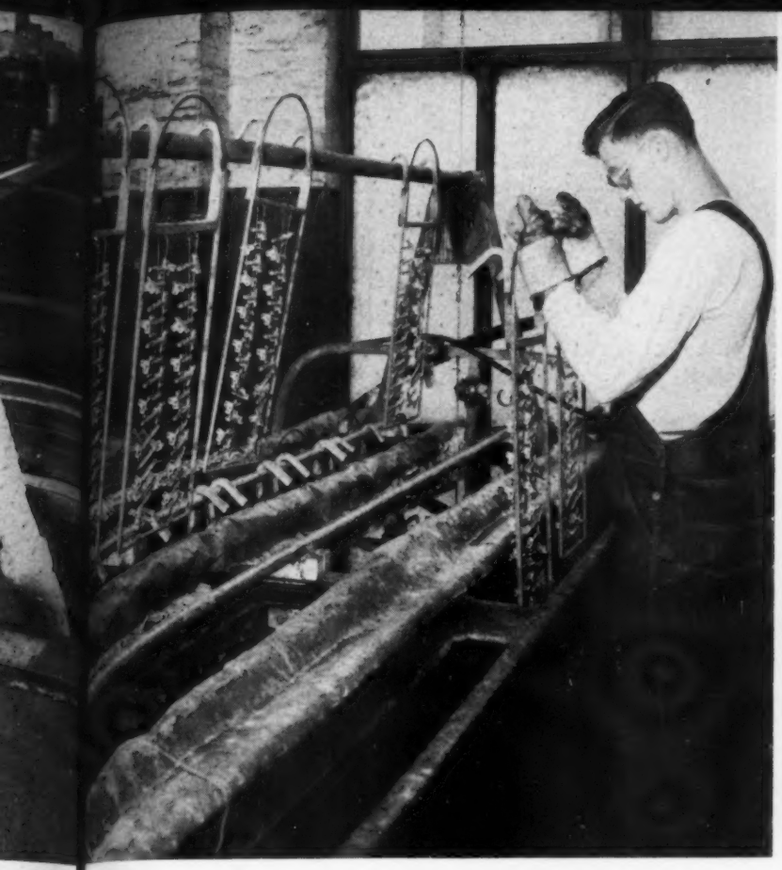


To simplify classification and accounting for all grades of scrap, Western Electric has adopted a numerical system. All nickel-bearing alloys, for example, are in the No. 9 group, and the various grades of nickel scrap are identified as 9.01, 9.02, 9.03, etc. Since Western re-uses much of the nickel-bearing scrap in its own casting operations, ends of cast ingots are painted in accordance with a color code. This designation is lost during hot rolling, but is re-applied to the cooled bars. Chips from the bar milling operation are also marked (left) with colored paint. The color code designation is carried on through the cold rolling operations until the material is ready for delivery. In the case of permalloy, black identifying symbols are printed on the scrap (right) by means of a roller

Punch-press skeleton of both non-ferrous and magnetic alloys is baled by Western Electric for convenient charging into remelting furnaces. Nickel-silver bales are charged into an electric induction furnace (below), and bales of nickel-iron alloy are charged into an arc furnace, for reclamation





The reclamation process seems endless. For instance, when the rinse water from the nickel-plating procedure becomes sufficiently concentrated, it is pumped back into the plating tank. The nickel nodules that form on the contact points of rotary plating drums are removed and re-used in melting

In melting nickel-bearing magnetic alloys, some metal is inevitably carried away in the slag. To combat this sort of loss, Western Electric puts the pulverized slag through a magnetic separator (left) which picks up magnetic particles and delivers them into side chutes for re-use in melting operations. Reclamation is also continued to an extent in nickel-plating operations. For example, short lengths of used nickel-plating anodes are placed in a rubber basket (right) in contact with longer anodes, and thus are completely consumed. When a rack of parts that are being plated is lifted out of the plating tank, it is hung in such a way that the electrolyte drips back into the tank and is thus recovered. The racks are then rinsed in a water chamber which removes most of the remaining electrolyte

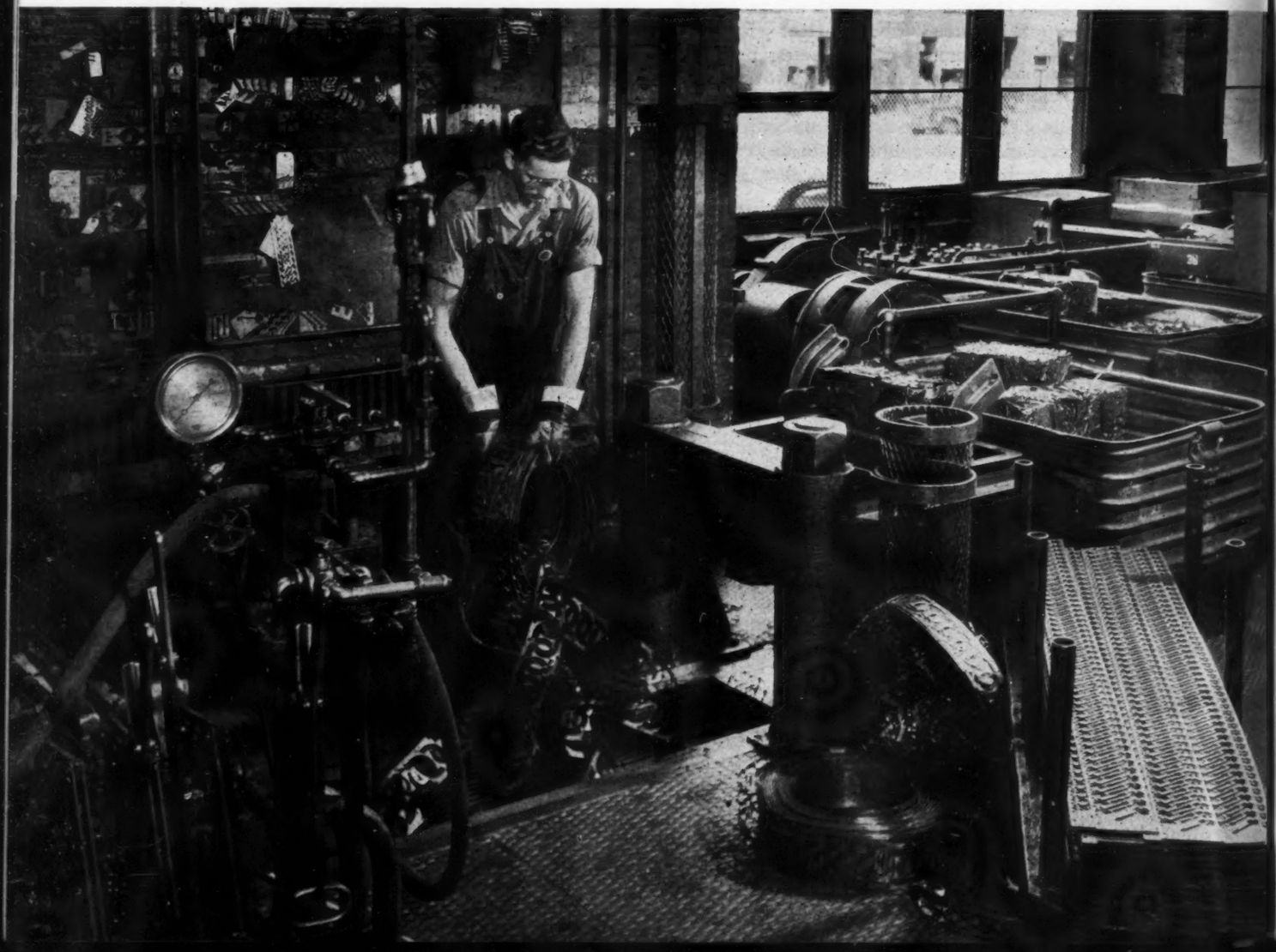
(CONTINUED ON NEXT PAGE)

WAR METALS FROM SCRAP

(concluded)

Not only superfluous metal, as in punch-press skeletons, but also junked apparatus in various stages of assembly are grist to the reclamation mill. Contact metal (left) is clipped from nickel-silver springs; nickel-bearing cores (right) are recovered from junked coils. Wherever possible, component metals are removed from dismantled parts and assemblies, and distributed by classes in the scrap barrels

When identification either by marking or color code is not feasible, alloys are sorted by scrutiny of the punch-press skeletons. And to insure positive identification of the metal, labeled samples of punch-press skeleton are posted on a bulletin board near the baling press in the reclamation section



CONSERVE MATERIALS—THEY WILL WIN THE WAR

Westinghouse uses domestic in place of Japanese paper to insulate enameled copper wire

Let's Look at Substitutes

SCARCITY AND CHANGE are the two things American industry can bank on in its current approach to the perplexing problem of substitute materials. At the moment, the really plentiful materials that industry is accustomed to use, can be numbered on the fingers of one hand. And the moderately abundant material of today may be the critically scarce material of tomorrow.

Substitution in itself is a relatively thin-shelled nut for the design engineer to crack. The engineer always gets his substitute. Copper pinch-hits acceptably for aluminum in many applications, molded plastics for zinc die castings. But copper is roughly as scarce today as aluminum, or approximately as plentiful as hen's teeth, and already only certain kinds of plastics are freely to be had.

Proposed substitutions may thus become ancient history overnight. The only good approach is to *find a substitute and begin immediately to develop a substitute for the substitute.*

It would be a big help if a complete survey of the materials situation could be made, and a complete set of answers supplied.

An Ever-Changing Picture

That, obviously, is impossible. Even if complete data could be had, the picture is changing from day to day. A spot survey, on the other hand, is possible, and has been made by FACTORY. It will serve to define the problem and indicate some of the answers as found by representative industrial concerns. It should be remembered, however, that the answers are good only as of about January 20. The companies cited may already, in the examples here given, be hunting a substitute for the substitute.

Wm. Wrigley, Jr. Company. When it became apparent that there would be a shortage of aluminum, Wrigley voluntarily gave up its stock of aluminum billets, turning over 500,000 pounds of this precious metal to the government.

Changes were made immediately in the gum wrappers, waxpaper or composition or tin foil being substituted for the aluminum foil.

The company told retailers "there is no substitute for aluminum in airplanes," but "there are many good substitutes for wrapping Doublemint Gum. Frills in packaging are not important. Your customers enjoy the gum, not the wrapper." This dealer

notice was printed on unbleached paper, thus conserving chlorine.

Today the gum is being packed in a new box to conserve boxboard. The box has a transparent outer wrapping instead of a cover, and the display flap has been eliminated.

Easy Washing Machine Corporation. Washing machines, by their very nature, have always been large users of non-ferrous metals—and these metals are among the most critically needed for the war effort.

Easy, like many other concerns, saw these shortages coming and embarked some months ago on a program of substituting plastics wherever possible for aluminum, copper, and zinc. The widest application of plastics has been in the washing devices used to agitate the water in the tubs of the machines, although many other parts have been molded of plastic materials, including cover, top rings, and bottom of the spindrier assembly; wringer adjustment knob; wringer reset lever; washing device screw cap.

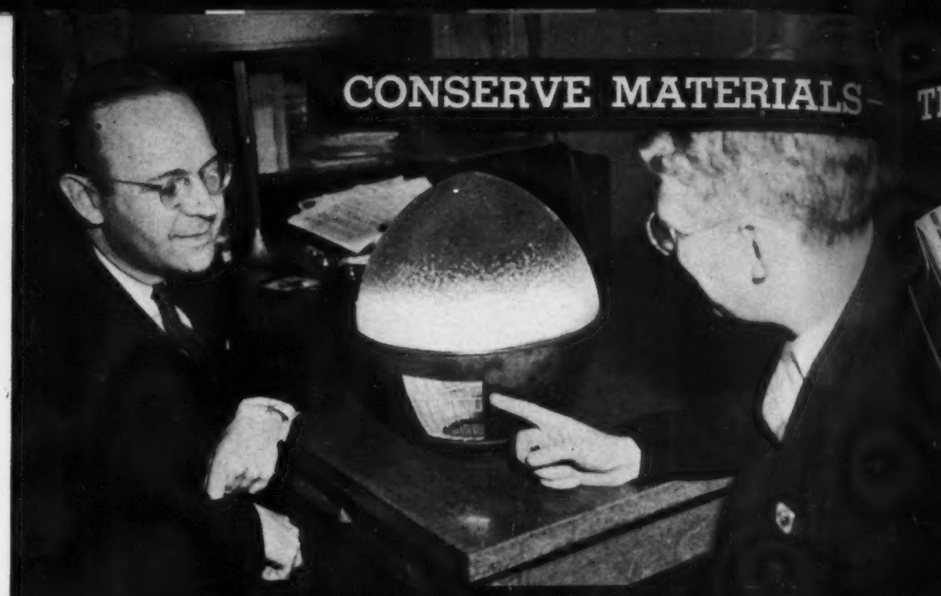
York Ice Machinery Corporation. An interesting development in the production of finned coils for refrigeration has led to the substitution of steel for critically needed aluminum and tinned copper.

This type of finned coil formerly consisted of aluminum fins on a tinned copper tube. The finished coil assembly is not made to any standard size, but in each case to the detailed measurements of the location into which it is to be fitted. The square fins were formed from strip aluminum and automatically assembled in any one of three pitches by being held together with aluminum corner strips. Into this assembly of fins the copper tubing is inserted; after the coil is formed to the required dimensions, the fins are fastened to the tubing by expanding the tubing with fluid pressure.

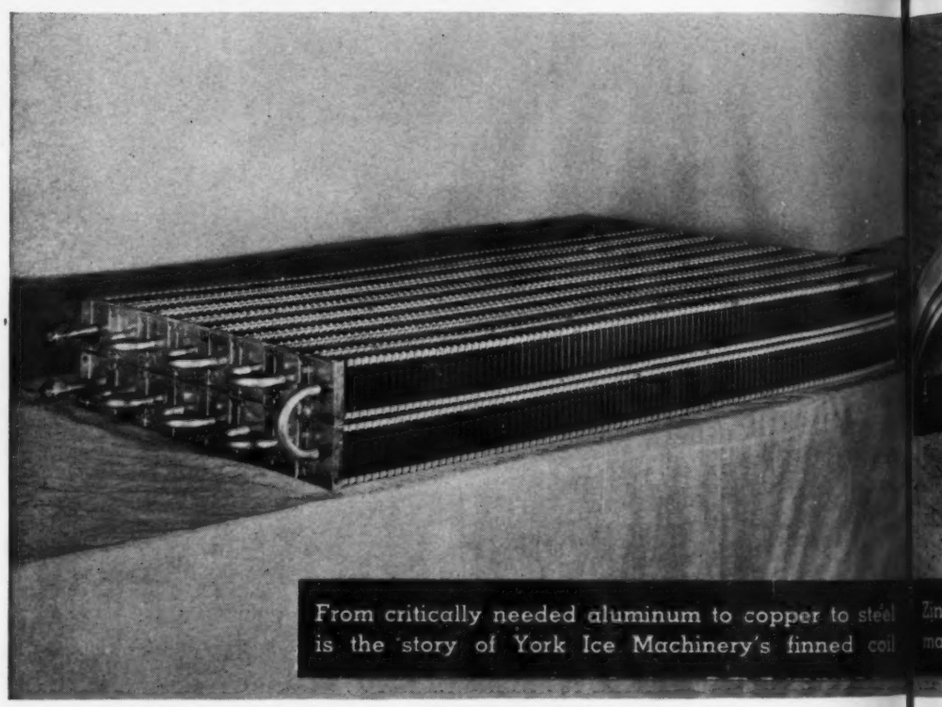
With supplies of aluminum strip exhausted, a change was made to tinned copper strip. In order to keep the weight of the coil from being excessive, it was necessary to reduce the thickness of the fin, which did not adversely affect the heat-transfer value. Just as in aluminum construction, the temper of the corner strip that holds the fin assembly as a unit was the most important feature to be worked out. This strip is fed rapidly through an assembly machine which, working from four separate reels, forms this corner strip tightly around each corner of the individual fin.

As copper supplies dwindled, arduous development work produced fin

(*Continued on page* 184)



Silvered glass, replacing aluminum in reflectors, increases efficiency 10 percent (General Electric)



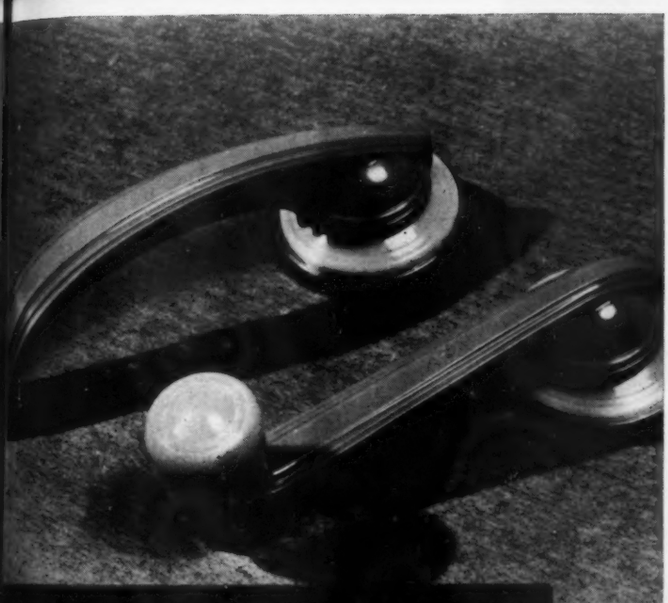
From critically needed aluminum to copper to steel is the story of York Ice Machinery's finned coil

Spun glass makes an adequate substitute for asbestos in insulation for copper wire (Westinghouse)

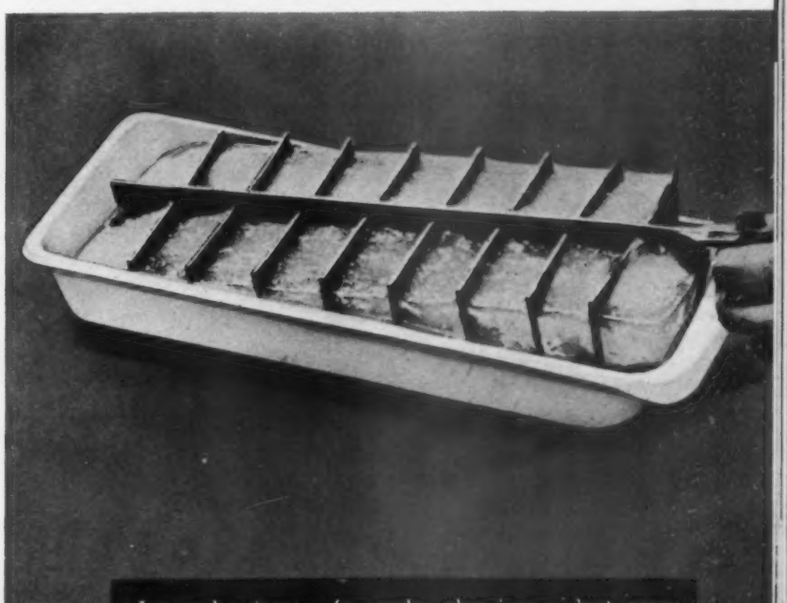
THEY WILL WIN THE WAR

Aluminum foil eliminated. Transparent wrapping instead of cover, to conserve boxboard

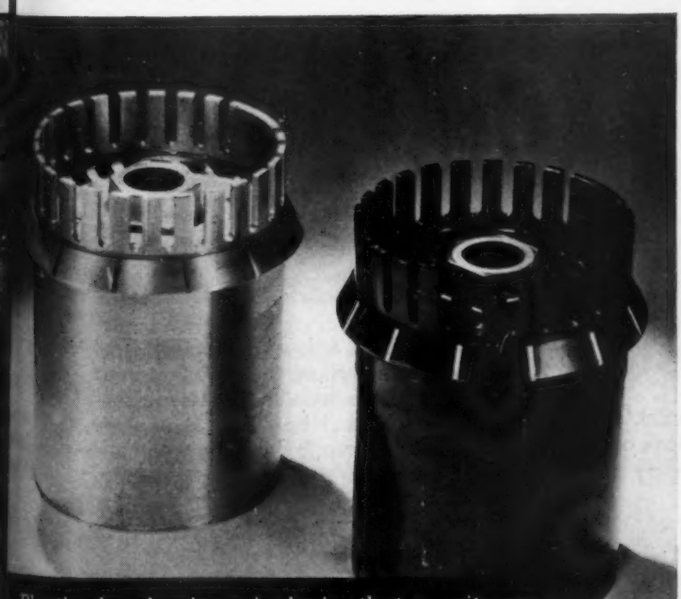
Plastic noses for shells are strong enough to be substituted for aluminum (Westinghouse)



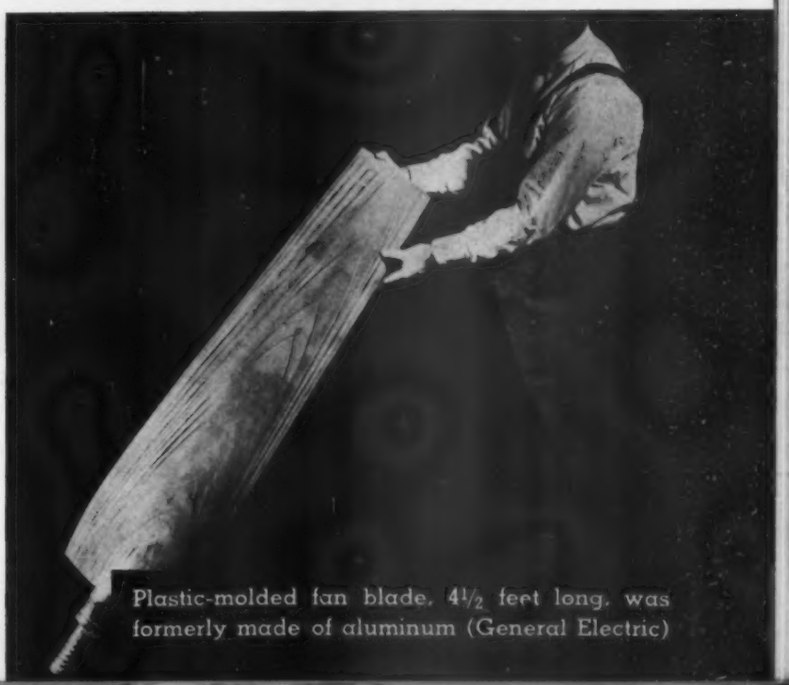
Zinc die-cast handles now of thermoplastic material molded with steel insert (Chrysler)



Ice cube tray, formerly aluminum, but now thin sheet steel, porcelain enameled (Norge)



Plastics for aluminum in device that permits preselection of work speeds (Warner & Swasey)

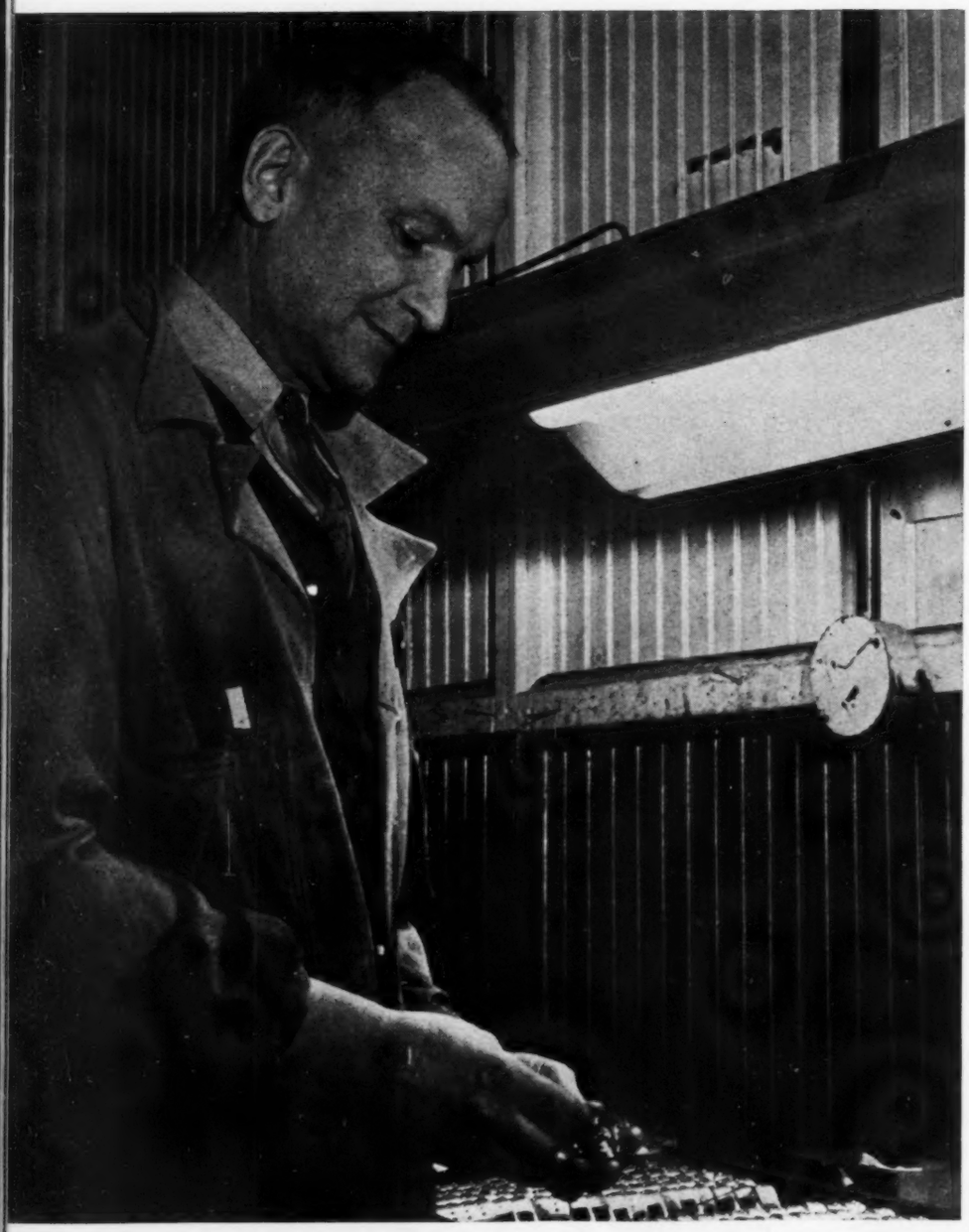


Plastic-molded fan blade, 4½ feet long, was formerly made of aluminum (General Electric)

Wanted—Men Over 50!

So, in effect, ran a recent advertisement in a New England newspaper. It helped one plant with big war contracts turn up a score of experienced inspectors. May it serve to remind other manufacturing concerns of a virtually untapped source of skilled labor

LEWIS K. URQUHART, Associate Editor, *Factory*



Tom Coleman admits to only 45 years. Once a machinist, gassed in the last war, rehabilitated as a draftsman. Fourteen years on a newspaper, four as county jailer. Now an inspector, and happy as a clam

"SORRY, MISTER, YOU'RE TOO OLD. We want a younger man for this job!"

Thousands of workers past 50 have heard those crushing words and trudged on with heavy hearts, hoping to find some plant where gray hairs and long years of experience might be welcome.

A man in Bridgeport has changed all that, at least so far his own organization is concerned. The man is W. I. Newman. He is personnel manager of Manning, Maxwell, & Moore, a company that suddenly found itself called on to furnish huge quantities of highly technical products, such as airplane instruments, pressure gages, thermometers, and safety valves for all types of ships, tanks, and other defense equipment.

So great were these defense demands that the number of people employed by his company had to be practically tripled in a few months. And because hundreds of other factories in New England also wanted more and more highly skilled workers at the same time, Bill Newman's job wasn't any easier. He literally combed every town, hamlet, and trade school in this part of the country rounding up prospects.

He hired and trained hundreds of boys, girls, and women to assemble, solder, and test delicate instruments. But he couldn't train inspectors fast enough to meet the ever-increasing defense demands. So he decided to call back the old-timers.

Here's the advertisement he ran in the newspapers:

Mechanical Inspectors

Local defense plant has need of several mechanical inspectors experienced in the inspection and measuring of machined parts. Must be able to read blue prints and micrometers.

No age limit. The only requirements are ability to do the work, American citizenship, and not presently employed at the trade in any defense industry.

This is an opportunity for older men, who may have been retired or pensioned, to resume their usefulness and do their bit in the present emergency. The work is light and pleasant, working conditions are of the best, and compensation is fair.

Give full particulars concerning age, past experience, etc. in first letter. Address No. 2139 this paper.

When old fellows first read this ad they didn't believe their eyes. It must be a trick to swindle them somehow. It just couldn't be. "Still it says age is no handicap," they hopefully told their wives. And so they swooped

down on Newman like a swarm of 70-year locusts. In a short time he was able to pick out over a score of experienced inspectors, as well as some splendid trained material for other jobs as well.

"How are these old-timers working out? Why did they want to come back to work again? How do they like working after having been retired?" I asked Chief Inspector W. E. Carlson.

"One at a time," he pleaded. "We are pleased beyond words with the sincere, capable, and enthusiastic way these oldsters are taking hold. And as for why they wanted to come back to work, and how they like it, suppose I let you ask some of them yourself."

"Fine," I replied, and he took me out into the plant.

The first of the new Old Guard we met was Reginald B. Reed, 58 years old. He had been a machinist years ago at a sewing machine company. Then he got into accounting work and became comptroller and later general manager of a Brooklyn metal-working plant, earning from $10,000 to $12,000 a year. Later he served as a public accountant; finally retiring and building his own home in Bridgeport.

"I don't need the money," said Reed, "but I wanted to do something to help our defense program, and confidentially I'm having more real fun inspecting these airplane instruments than I've had in years—and I feel better working again, too."

As we walked away, Carlson had the same satisfied look that is seen on an antique collector's face when he exhibits a choice highboy that he has discovered with several coats of paint on it in an old Vermont woodshed.

"You'd have to burn the plant down to get him out of here," gloated Carlson. "He's having the time of his life."

Next we talked to Jerry Dahl, aged 70. For 20 years he had been general foreman in a famous automobile plant. He did much of the detail work in getting his company into the production of Liberty Motors during the first World War. Today he is doing a bang-up job as a final inspector of safety valves being built for our Navy and merchant marine.

"It's sure great to be back in harness again," he chuckled, "and doing my bit just as I did during the last war. What's more, it's good to be with my old pals again. There are about thirty of my old gang from the automobile company working here now," he said, as he waved a cordial greeting to one who was just passing.

"You'll find the next chap an interesting example of a man who has found himself late in life," Carlson confided as we went upstairs and met Fred Helbig, aged 61. Fred had been a butcher until six years ago when he started loafing. When he answered the advertisements for older men, Bill Newman told him to go and take the defense training course at the local trade school, more to get rid of him than anything else, since he had had no previous mechanical experience.

"Mr. Newman was sure surprised when I came back after four months' trade school training in blueprint reading and other basic shop practice—but he gave me a chance," said Helbig, as his eyes filled and he choked up. "They're letting me handle more intricate parts every day. I know now that I should have been a machinist and not a butcher all my life. The work is very interesting, and," he cracked, as he nudged me, "the wife is glad to have me out of the house all day."

"How'd you like to sit in on an interview of one of these old boys

(*Continued on page 166*)

Meet Jerry Dahl, 70, who is doing a bang-up job of inspecting safety valves for the Navy. "It's great to be back in harness," says Jerry

Walter Perry, 59, is typical of the score of old-timers who were selected by Manning, Maxwell, & Moore and put on inspection work

Sure You Know Your Visitors?

Fire in New York. Wreck in Ohio. Explosion in New Jersey. The saboteur is abroad in the land. And "abroad"—out of its plant—is precisely where this company with a factory full of war orders aims to keep him

J. R. MUDLER, Cashier, [redacted]* Company

OUR VISITOR CONTROL SYSTEM, installed some months ago, is designed to keep the saboteur out.

Visitors, we know, are essential to the successful conduct of our business. Certain salesmen, for example, have to be seen. We can't get along without them. Yet, with our country at war and our plant full of war orders, we are reluctantly forced to the conclusion that every visitor within our gates is a potential saboteur.

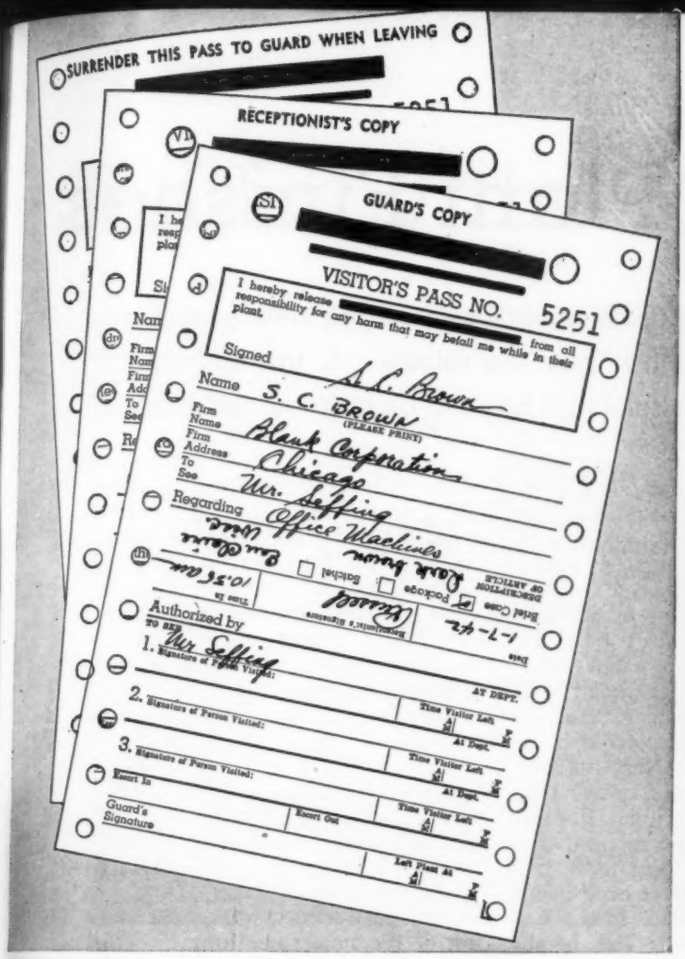
Now all we know about the saboteur is that when and if he comes to our plant he won't look like a saboteur. Instead he may very well look like any one of the several hundred visitors who hand their cards in at our receptionist's window every week. It is therefore our responsibility to our employees—and our patriotic duty to our country—to make certain that these visitors are exactly what they represent themselves to be.

So, our visitor control system. With a minimum of red tape and paperwork it speeds admission of visitors, fixes responsibility for entry, conduct, and exit. Controls removal of articles. Records names of people seen and time involved.

* War-Department deletion.

Illustrations by courtesy of Standard Register Company

Mr. Brown of Blank Corporation is calling by appointment on Mr. E. A. Seffing, [redacted]* Company's controller. First thing the receptionist does is 'phone Mr. Seffing who says he's free, send Mr. Brown right in. So she asks the visitor to sign the release at the top of the pass which is contained in triplicate in the register at her window. He then supplies firm name, address, purpose of visit, name of person he wants to see. Meanwhile the receptionist writes in, on the upside-down line (see pass on facing page) the date, her name, and time in, noting that Mr. Brown is carrying a dark brown calfskin briefcase. While she is doing this, the guard opens and inspects the case, finding no incendiary bombs. So the receptionist hands the pass to Mr. Brown who, by means of the buttonhole cut into the heavy stock on which the pass is printed, affixes it to his coat. In so doing he leaves latent finger-prints, which can be developed later on if the occasion demands. Guard signs as escort


SURRENDER THIS PASS TO GUARD WHEN LEAVING
RECEPTIONIST'S COPY
GUARD'S COPY
VISITOR'S PASS NO. 5251
I hereby release from all responsibility for any harm that may befall me while in their plant.
Signed S. C. Brown
Name S. C. BROWN
(PLEASE PRINT)
Firm Name Blank Corporation
Firm Address Chicago
To See Mr. Seffing
Regarding Office Machines
Authorized by Mr. Seffing
1. Signature of Person Visited:
2. Signature of Person Visited:
3. Signature of Person Visited:
Guard's Signature

Pass is in triplicate. Guard's and receptionist's copies on ordinary paper. Actual pass on heavy stock. Guard's copy goes to guardhouse. Receptionist's copy stays in continuous form in register compartment, providing permanent record

Formalities over with, the guard takes Mr. Brown to Mr. Seffing's office, returns to guardhouse with guard's copy of pass. In this way, the visitor is under constant surveillance. Plant police know exactly which visitors are in plant and where

Our visitor has now concluded his interview whereupon his host, Mr. Seffing, affixes his signature to the pass, and calls the guardhouse on the telephone. A guard is immediately dispatched to conduct Mr. Brown from the interview to the guardhouse

Final scene. In the guardhouse. The guard hands the visitor's pass to the chief of the plant protection force, who matches it with the original guard's copy in his file. Both copies are sent at the end of the day to the personnel department. Curtain

Conveyorized Plant Finishes

Modern handling at its best—in big new ordnance plant where it's "ride the rollers" for the millions of bombs and shells that have to be painted and loaded

THE HUGE $60,000,000 Iowa Ordnance Plant, which sprawls over 35 square miles of what was but recently quiet farm land, is now in operation. Although work on its permanent structures did not start until the middle of January, 1941, it was practically completed by midsummer—a feat all the more astonishing when one realizes that the project included almost 700 buildings, more than 100 miles of highway, 77 miles of railroad, and an electric generating station big enough to supply all the power needed in the plant's operation.

The Iowa Ordnance Plant is a loading station for shells and bombs. Here the empty metal bodies are shipped from various forging works throughout the country to be filled with molten TNT and to be fitted with the fuse, detonator, and booster mechanism—the "explosive train" necessary to detonate the relatively stable, but terrifically powerful, TNT.

Empty shells and bombs arrive at the plant painted on the inside with an acid-resistant substance, on the outside with a protective primer. Then, before they are loaded, all exterior surfaces except rifling bands are given a finish coat of lacquer enamel.

This painting of shells and bombs prevents deterioration due either to the corrosive action of the charge or to rusting during storage, which may be for a period of years, in warehouses or in ammunition dumps.

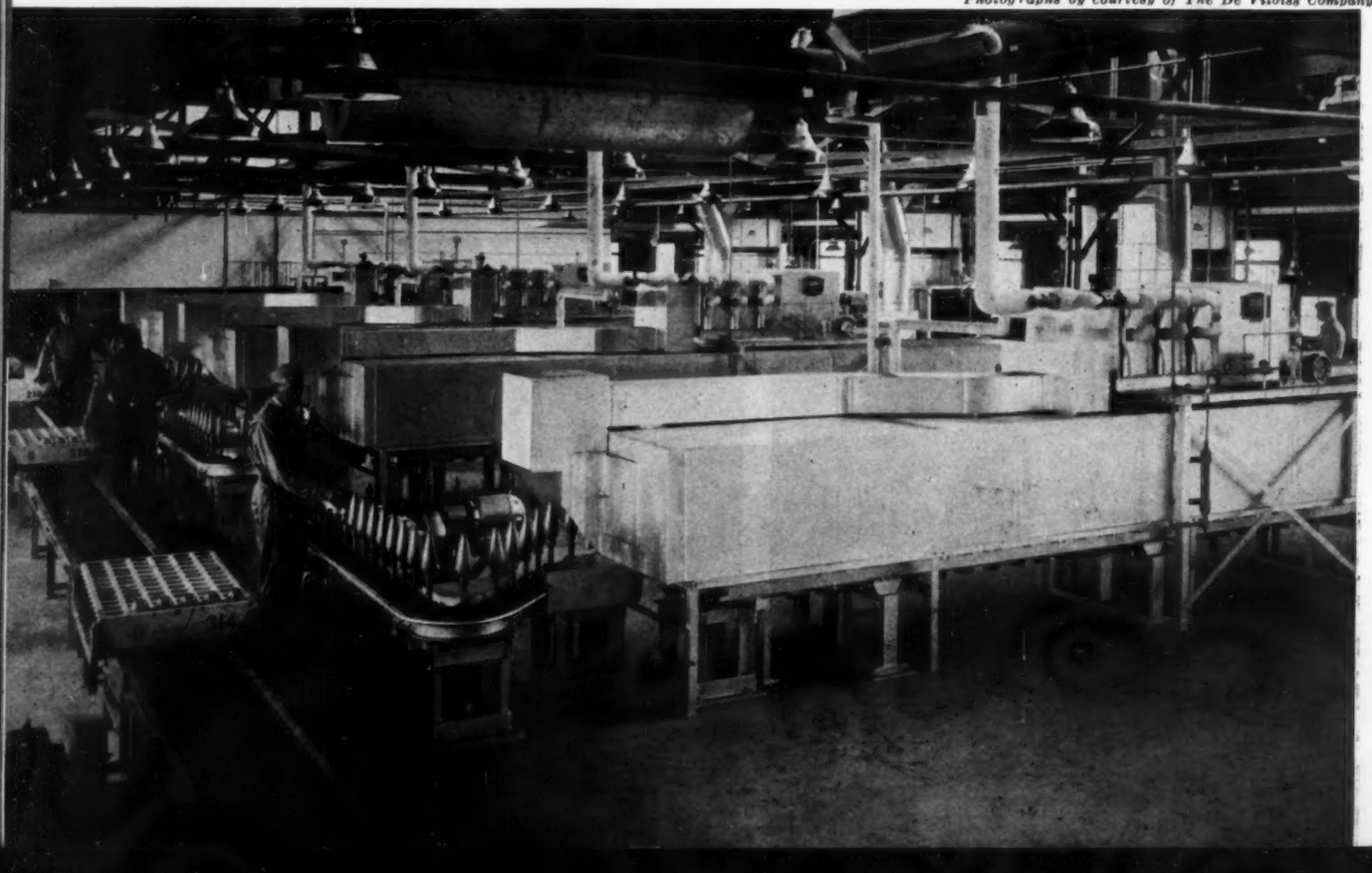
Twelve hours or more before they are to be painted, the shell and bomb bodies enter the painting shops in box cars. This gives them sufficient time to come up to room temperature, a requisite to the satisfactory application of the lacquer. Next the projectiles are placed on the spindle conveyors of the spray machines. Flanged metal masking rings are dropped over the rifling bands to keep those precisely machined parts free of paint. Thread shields are placed in the fuse openings of the shells and bombs which ride nose-end up on the spray-machine conveyors. The projectiles that ride nose-end down need no fuse thread shields, for they are protected in those sections by the workholders. Then the bombs and shells are automatically painted and force-dried.

The four spray machines on Line No. 1 have a total painting capacity of nearly 100,000 units every 24 hours. On each, the spray station is equipped with four automatically actuated guns. As each shell or bomb reaches an "index" point about midway through the spray station, it is momentarily halted in its lateral travel and begins to rotate. Then the guns automatically open and spray all exposed surfaces of the projectiles. These guns are so controlled, however, that they will not spray empty spindles, thus preventing the fouling of the holding part of unloaded workholders, which must always be kept clean to avoid a consequent fouling of the nose fuse threads. This feature also prevents the wastage of paint in spraying empty spindles and gives the operators a chance to skip spindles when desired or to leave the machines when necessary without stopping them.

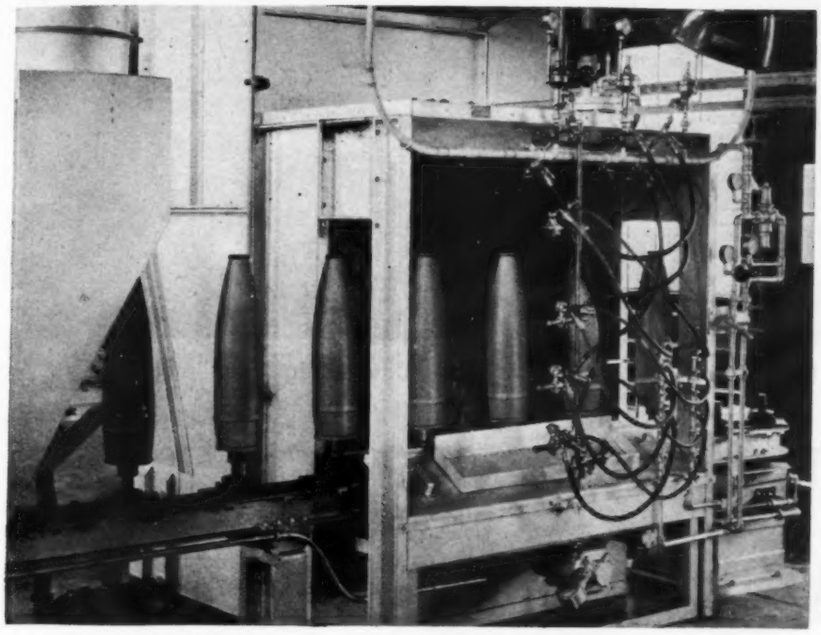
The conveyor on each machine

On Line No. 1, four spray machines have a painting capacity of nearly 100,000 units every 24 hours. Shells or bombs travel by chain-on-edge conveyors on revolving spindles placed 8 inches apart

Photographs by courtesy of The De Vilbiss Company



Shells by the Million



Conveyors in Line No. 2 are 145 feet long, move 7 feet per minute. Spindles, 16 inches apart, revolve 60 to 100 times each 60 seconds

travels 12 feet per minute and is over 171 feet long. About 94 feet of it weaves back and forth through a 32-ft. drying oven heated by steam to 150 degrees Fahrenheit.

All these conveyors are the chain-on-edge type which moves on extended side bars that slide along a lubricated track. Sturdy vertical spindles, on which the workholders are placed, are mounted on the chains every 8 inches, and are rotated during passage through the spray stations. They turn on tapered roller bearings, and their rate of rotation is adjustable from 300 to 420 revolutions per minute, so that each size and kind of shell and bomb loaded on Line No. 1 can be most effectively coated.

The spray guns on each machine are located in a spray booth equipped with an elevated nozzle-type water-wash chamber. This water-wash chamber provides the most efficient and safest type of exhaust for an installation of this kind. It prevents the accumulation of paint in the stack with its ever-present danger of combustion, and it safeguards the health of workers by preventing the contamination of the atmosphere by paint dust.

Air is kept moving through machine booth openings at a velocity of 250 lineal feet per minute by means of a motor-driven fan installed in the stack of each booth, outside the building, with the motor in a weather-proof housing. Oven fumes are also carried to the outside. For that purpose, the duct from each oven is fitted with a small fan which is aided by the convection currents in the oven.

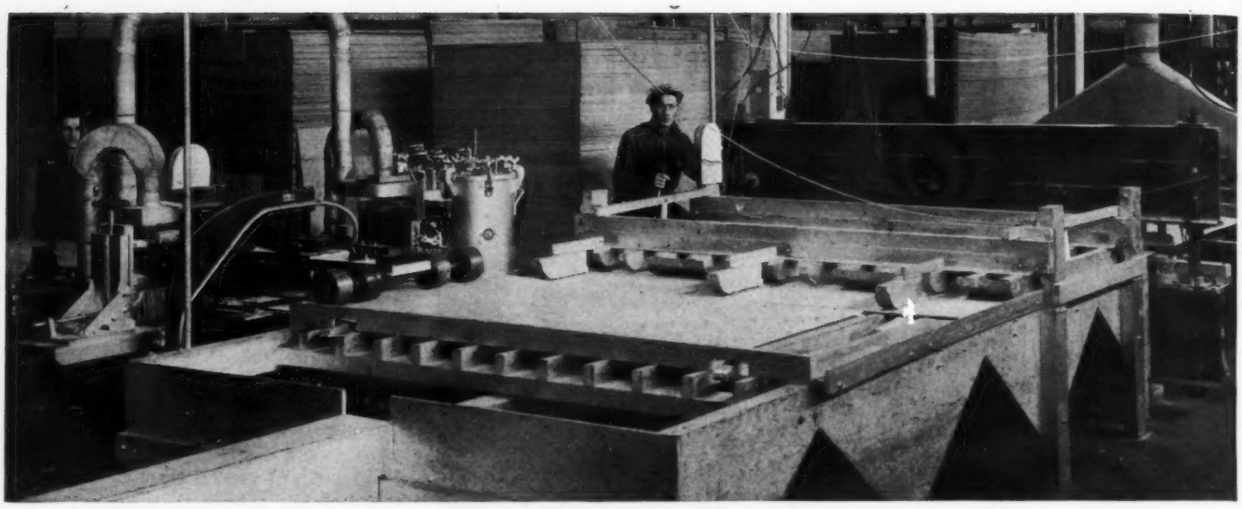
Loading Line No. 2 has three automatic spray-painting machines and three hand-spray booths. The shells are painted by three automatic machines. The bombs, however, because of their greater weight and unwieldy size, are hand sprayed in three water-wash booths.

The three automatic machines on this line are similar to those on Line No. 1, differing only in spacing and rate of revolution of spindles, speed and length of conveyors, number of spray guns, length of ovens, size of booths and exhaust fans, structural strength, and resultant production rate. These differences are necessary, of course, in order to insure most efficient coating of shells in the larger calibers and heavier weights loaded on Line No. 2.

Each of the three automatic machines has a capacity of over 7,000 shells every 24 hours. Here the spindles' rate of rotation is adjustable from 60 to 110 revolutions per minute, and their spacing is 16 inches. Each conveyor is 145 feet long and moves 7 feet per minute. Six spray

(*Continued on page 180*)

Each loading line has its own paint circulating system, comprising four 120-gal. mixing tanks, electric agitators, and two pumps



Prefabricated, demountable houses are manufactured by up-to-date straight-line methods

Line Production Speeds War Housing

Time is of the essence in wartime housing projects. Homes pre-built to exact specifications are carried to location by truck, put together quickly and easily

COTTON CLOTH applied with synthetic resin to plywood panels adds extra quality and an insulating factor to prefabricated, demountable houses. This use of cotton cloth was developed by The Speedwell Company, Seattle. How to apply the canvas on an automatic line was the next problem, solved by company engineers so that now 16 feet of canvas-covered plywood are delivered every minute.

First a series of 4x8-ft. plywood panels are notched, fitted, and glued into 110-ft. boards. These boards ride under a hot press, through sanding operations, under a cabinet filled with dry ice, until they get to the station where they meet the synthetic resin adhesive, which is applied from pipelines operated under air pressure from overhead tanks. Next under a rubber blanket to smooth the glue, then application of the canvas which is fed from a roll placed on the line. Drying under infra-red lamps follows—and canvas-covered plywood is ready to cut into the required lengths.

Now to the fabrication line, where interior and exterior wall panels are glued to the framing members. A jig is used to insure proper placement of studdings. Size of the wall panels is determined by placement of doors and windows. Doors, window frames, and door frames are made on a supplementary line, and all fitting is done at the factory. From stockpiles trucks are loaded with walls, and window and door units, all ready to be set up.

Two duplex houses leave the factory daily for the navy yard housing project at Bremerton, Wash.

Carter Products, Incorporated

V—Does It Pay to Treat Men as Individuals?

"Operators always put it over on you," says Al. "They won't try to if they're treated squarely," Cal replies. Two opposing views as expressed by supervisors at the fictitious company whose story continues in this, the fifth, installment

JOHN H. HILL, Industrial Engineer, Bundy Tubing Company, Detroit

"MR. ROURKE CALLED UP," said Al Peasely, my boss in methods and time study. "He wants me to send you over for a few days because Chuck Meyers is sick. Better go over right away."

Steve Rourke is superintendent of our brass foundry, and Chuck Meyers is the time study man who regularly works in this division of Carter Products, Incorporated.

I always like to go to the foundry. It's only a little place employing about 75 men all told, whereas the main plant employs around 1,300.

Men Who Work

I spent about six months there shortly after I came to Carter Products. If you've ever worked in a foundry, you know what I mean when I say it gets into your blood. Just to walk in there and smell core oil burning inside steaming molds; to see liquid metal sliding into open ladles and mold gates, hot, deadly, and relentless; to see men who really work and are proud of it; these are things you don't forget.

"Every plant has its own atmosphere," remarked Cal Martin to me one day. "Walk through a shop and you can feel its personality—what the management, 'way at the top, is like; how the employees feel; whether it's different or not. It may take you a long time to find out what's back of that sixth sense, but you can generally predict how a plant will handle things, the same as you can tell pretty much what any individual will do under most circumstances."

Cal's been around quite a lot and is gradually getting more of the attention he deserves as a foreman at Carter's. I thought of his observation the day I went over to the foundry to pinch hit for Chuck. When you walk into the foundry, you feel as if you're in a place that isn't connected with Carter Products at all.

"I couldn't prove anything," stated Al, looking up from a putt. "I just know how men are. They're human and looking out for themselves."

As I went in, the 9 o'clock heat was being poured. Excited cries came from the dirty, goggled faces of the men as, in turn, they came into the gleam of the hot liquid and vanished from it in quick succession.

"Watch it!" yelled one man.

"Hup!" cried another.

"Get in there and get that hot stuff!" shouted a perspiring negro.

Standing at one side was Steve Rourke, looking on, seemingly unconcerned. Yet his eyes took in everything.

After the big ladle was empty and the last mold filled, he turned to me. "There are two new jobs today. Bill Skebba over there has one of them; Art Kiesling has the other. Check 'em over, and come in and see me afterwards."

I went over to Bill Skebba's bench. He was just taking off his pouring leggings and putting on his leather apron.

"Hello, young fellow," he greeted me. "Gonna give me two cents a mold on this one?" He smiled and went on with his preparations for molding.

He handed me the job card, and started to work. With sure, easy motions he seeemed to slide from one

(Continued on page 160)

Time Now for Brass Tacks in Employee Relations

WHITING WILLIAMS, Consulting Editor, *Factory*

Too much hoss-trading. Too much cross-table dickering. Too many employers giving so much attention to union committees that they had little time to think about the interests of their rank-and-file workers. The trend away from the real thing has been altogether too plain . . . Now for a revival of sound and wholesome human relations in the plant

"WAR OR NO WAR," declared a group of labor big shots in a Midwestern city two days after Pearl Harbor, "we can't be expected to abandon our mission. That mission is to organize the unorganized and keep pushing for higher wages, better working conditions, and greater union security."

Considering that the President's 24-man conference lately brought forth only a pious hope for labor peace, it requires optimism for any employer to expect his union committee to soft-pedal many of its demands for either more money or more power. Nevertheless, that same employer will do well to observe that those treacherous Jap bombs on Pearl Harbor wrought, along with their damage to our Navy, several significant and constructive changes.

For one thing, they blew us suddenly into a greater national loyalty and unity than we have known in years. For another, they awakened in every single one of us a larger sense of our individual importance, dignity, and responsibility. On the instant, to every last man and woman of us, our ordinary troubles and annoyances appeared picayune and petty; our daily jobs, whatever and wherever, suddenly appeared less a mere means of livelihood than an opportunity to show our soul's mettle for serving and saving our beloved country.

Still further, those same bombs shocked each of us into a feeling of uncertainty and confusion bordering on fear as to just how the war, so suddenly become our war, is going to affect our country and our own daily lives—and thus increased the need and wish of every last one of us for the reassurance of courageous, competent leadership.

Under these circumstances, we must consider ourselves fortunate that our country's leader in the White House has so long enjoyed the confidence of the majority. But no single person can completely satisfy the wish created by those bombs. Other leaders, nearer home, are also needed. Hence every locality is likely soon to see the rise to usefulness and prominence of this Governor or that Senator, this Mayor or that local Chairman of Red Cross or Civilian Defense.

Similarly, in every plant, those same bombs bring to the employer heavier responsibility and larger opportunity. To handle them he has no choice today but to tackle both of these two jobs—to continue his hoss-trading with his committee there in his office and at the same time endeavor to reestablish with his rank-and-file workers out in the plant those contacts and relationships that have lately been so generally displaced by those same office dickerings.

How serious has been that displacement was revealed when, not long ago, the entire nation faced the complete stoppage of its defense and other activities at the hands of a few labor leaders in both coal and rail transportation. In both, it was plain enough that the cause of this vital threat were mainly leader issues rather than worker issues—that these few leaders were free to conduct their hoss-trading on the grandest imaginable scale largely because the workers in both fields had, thanks to national politics and national boards, long ceased to enjoy anything like "industrial" relations with their direct employers. ("One advantage . . . of this (captive mine) controversy," said John Lewis, "will be the passing of Mr. Davis and his hoss-trading Mediation Board!")

Exactly this same trend towards nation-wide leader hoss-trading, away from plant worker-relations, is today altogether too plain throughout all our industry. To anyone who travels around with eyes and ears open, it is disquietingly plain that too many employers are today giving so much attention to their union committee that they have all but stopped thinking about the interests of their rank-and-file workers. Altogether too many believe they still have a Department of Personnel and Industrial Relations when all they actually have in opera-

Sits with the committee hour after hour, day after day, week after week, trying to straighten out this or that shop grievance, wage adjustment, plant program, or company policy

tion is a Department of Labor Law and Dickering.

"How are you getting along," I keep asking each of my manager friends, "with your employee-relation problems?"

"Almost nothing else but!" is likely to be the reply. "'Hour after hour, day after day, week after week, I sit here with the committee, trying to straighten out this or that shop grievance, wage adjustment, plant program, or company policy—or to sidestep constant pressure for closed shop."

He thinks he has answered my query satisfactorily. Apparently he has forgotten that every minute of the working day his employees are getting good or bad impressions of him, his policies, and his leadership by what they read on the bulletin board or in the plant paper, and by the way they are being handled by his direct representatives—his plant gatemen, employment manager, paymaster clerks, foremen, gang bosses, and what have you. Apparently he has forgotten also that, almost every minute of the nonwork day, his workers' wives and families are wishing they could know more about their wartime budget, general prospects, and family security as the result of knowing more about their breadwinner's part in his big boss's plans and purposes for helping protect their common flag.

One reason for such forgetting is, of course, the manager's fear that some or other of his spoken or written words to his fellow-employees may, "war or no war," get him into court. Another is that the committee leaves him little time to think about anything else. In addition, those cross-table dickerings are often over items that are not only specific and pressing as compared with the general, continuous contacts in the plant, but in addition often involve large sums and immediate outgo.

Nevertheless, such forgetting plays directly into the hands of the men across the table. It allows them to force him into one small corner of the whole great field of his relations with his workers. In that corner the leaders usually appear as intent on mere temporary, short-term nibblings as he himself feels forced to be—also as inexperienced in such jockeyings as he. ("If they aren't new employees and therefore young and green, they're local boys I've known for years.")

What he overlooks is that, in between those long office gab-fests, these "boys" are constantly receiving from their international officers full instructions as to just how to make their apparently harmless dickerings fit into a

(*Continued on page 172*)

COMING: ANOTHER ONE-MAN POLL

Whiting Williams began to let his moustache grow on or about January 10. A few days later he donned one of his many worker disguises and was off for another month of the "double life" he leads every so often—the life of the workers he studies. *Factory* readers may therefore soon expect another unbiased Williams report of what's on the workers' minds, based on this latest "one-man poll of worker opinion." Look for it in an early issue

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

An Easy Way to Locate Small Parts

WAYNE T. WHEELER, Flint, Mich.

When setting up a new model and especially a new product, similar parts often constitute a problem. Wrong parts get in hoppers and cause all kinds of trouble.

Much of this trouble can be avoided by allocating one hopper for each part, and stenciling the name of each part on the hopper. Soldering or wiring the actual part on the front of the hopper helps the supply man still more. He can match washer, nut, or other parts to the master on the hopper itself.

Hoppers and parts should be in contrasting colors—that is, the hopper could be painted aluminum and the part and its name painted red.

This method not only avoids much confusion but also makes a neat, good-looking workplace for the operator.

•

Bundles of Scrap Steel Now Stay in the Car

R. A. SHAW, Detroit

Scrap steel compressed into bundles is carried by a conveyor up to a chute which discharges them into a gondola car. On

the whole this arrangement is simple and efficient, but considerable trouble was formerly experienced with bundles bouncing out of the car and falling to the ground. This tendency was, of course, particularly noticeable when the bundles began to pile up on the car floor. Aside from the injury hazard which this situation created, considerable labor was involved in picking up the fallen bundles and putting them back once more on the conveyor.

Little study of the problem was required to show that bouncing of the bundles was due to the velocity with which they passed down the chute and struck those already in the car. The method eventually adopted for reducing their velocity is shown in the illustration.

As will be seen, a hinged top narrow enough to fit inside the chute was mounted over it. It is held down by two compression springs which exert sufficient pressure to reduce the speed of the bundles passing down the chute, but not enough to stop them entirely, so that there is no chance of the material piling up.

By preventing the bundles from bouncing out of the car, this device paid for itself within a short time.

Saved Expense of 100 Percent Inspection

EDWIN H. SHAEFFER, Development Engineer, J. E. Ogden Company, Bayonne, New Jersey

The cost of 100 percent inspection of small tapped nuts was saved by installing a stop in the delivery chute of the four-spindle automatic tapping machine.

Most of the defective nuts were caused by an undiscovered broken, worn, or chipped tap running for a period after it had become defective. The operator inspected every 15 minutes, and at this time any bad taps were replaced. However, the taps usually went bad between inspections, and the resulting defective nuts from the bad tap fell into the delivery chute, and were scattered in the receiving bin with

(Continued on page 194)

Management, How Good Is Your Control?

Ask yourself these questions to check up

17. PARTS FLOW

1. Are you satisfied with parts flow through your unit as it now stands?

2. Is flow of parts through section rapid and uninterrupted? Where are the bottlenecks? Can they be remedied or eliminated?

3. Is the sequence of parts flow the most economical? Is there any doubling back or back-tracking? Any side-tracking? Have you done anything about it?

4. Do you make every possible effort to place all orders in normal work flow and keep them there?

5. Is parts flow to and from adjacent sections of your unit satisfactory? Are your activities delayed by other units? What can be done about it?

6. Do "past due" orders get priority? Does giving of such priority upset normal work flow too much? Do special jobs get priority? Do you inspect their urgency?

7. Are there any long interruptions due to inspection?

8. Does cleaning take too long? Are there too few cleaners? Too many? Do they interfere with each other's normal movement?

9. Does assembling take too long? Do you need more assemblers?

10. Are there any noticeably long delays in cleaning, assembling, machine operating or manufacturing? Can these be shortened?

11. Is your set-up for feeding orders to and from cleaning, assembling, manufacturing, operating, and inspecting, rapid and uninterrupted? Does each person involved understand and play his part correctly? Is it an automatic organized system, or merely a haphazard arrangement?

Next Month: Parts Storage

Prepared by HARDING PALMER, *Industrial Engineer*

Lockheed Aircraft Corporation, Burbank, Calif.

MAINTENANCE SERVICES

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

Stock Up Now on Coal and Coke

BUILD UP YOUR STOCKS of coal and coke to the limit. That is the advice and warning given by Secretary Ickes to industrial plants that depend upon these products for fuel and raw materials.

If this advice seems to conflict with governmental warnings against hoarding, always reprehensible in times of emergency, there are sound reasons behind it. It is obvious that the new production schedules will make unprecedented demands on the production and transportation of solid fuels. How seriously shortages in equipment and supplies will affect these facilities cannot be foretold, but some interference is certain. Transportation in particular is likely to be badly overloaded.

Until the Great Lakes navigation season opens on April 1, mines and transportation facilities will have some excess capacity that can be put to good use. After that date the annual drive to build up stocks in the Great Lakes ports, which supply the lake states and part of Canada all through the year, will get into full swing. It is to be expected that all transportation facilities will be fully occupied.

An ample stock of coal or coke is the best insurance against possible shortages. Now is the time to take out that insurance.

Old Parts Repaired Mean New Metal Saved

HERETOFORE when metal parts broke or became too worn for further use, maintenance could either repair them or get new ones. Various factors might help to determine which course was advisable, but it was always possible to decide one way or the other. Today the huge demand for metals and the scarcity of all those used in making ferrous alloys have severely restricted the choice between salvaging an old part or getting a new one. Now the alternative may well be: Repair or do without.

In consequence some well-known methods of salvaging have acquired new significance and really come into their own. Arc and gas welding, brazing, and metal spraying, are by no means new but their possibilities are being explored as never before.

A broken machine frame or gear, or a worn shaft, may be worth only a few cents a pound, as scrap metal. But they are almost priceless if a new replacement part can't be obtained. Frequently a few hours' work in laying down new metal and perhaps finishing to size will suffice to put the part back into service as good as ever, usually at a fraction of the cost of a new part. If a wearing surface has been built up with a more resistant metal, the part may be better than ever.

Hard surfacing is not only a widely used method of increasing the useful life of parts subject to wear—it is also playing an important role in making supplies of scarce alloys or alloy metals go as far as possible.

Use of a thin coat of corrosion-resistant metal over one that is much more vulnerable to attack is another application of prime importance.

Shortages of metals and other items may pose serious problems for some time to come, but there are available to maintenance some highly effective tools that will do much to solve these problems.

Don't Let the Sprinklers Be Shut Off Too Soon

MOST PLANTS are protected by sprinkler systems, but the mere presence of such a system is no assurance that it will operate effectively when put to the test. Instances are known where sprinklers were virtually useless because some of the piping was clogged with rust or other material—a piece of brick was found in one system, gravel and stones in others. Hence the need for frequent inspection and testing.

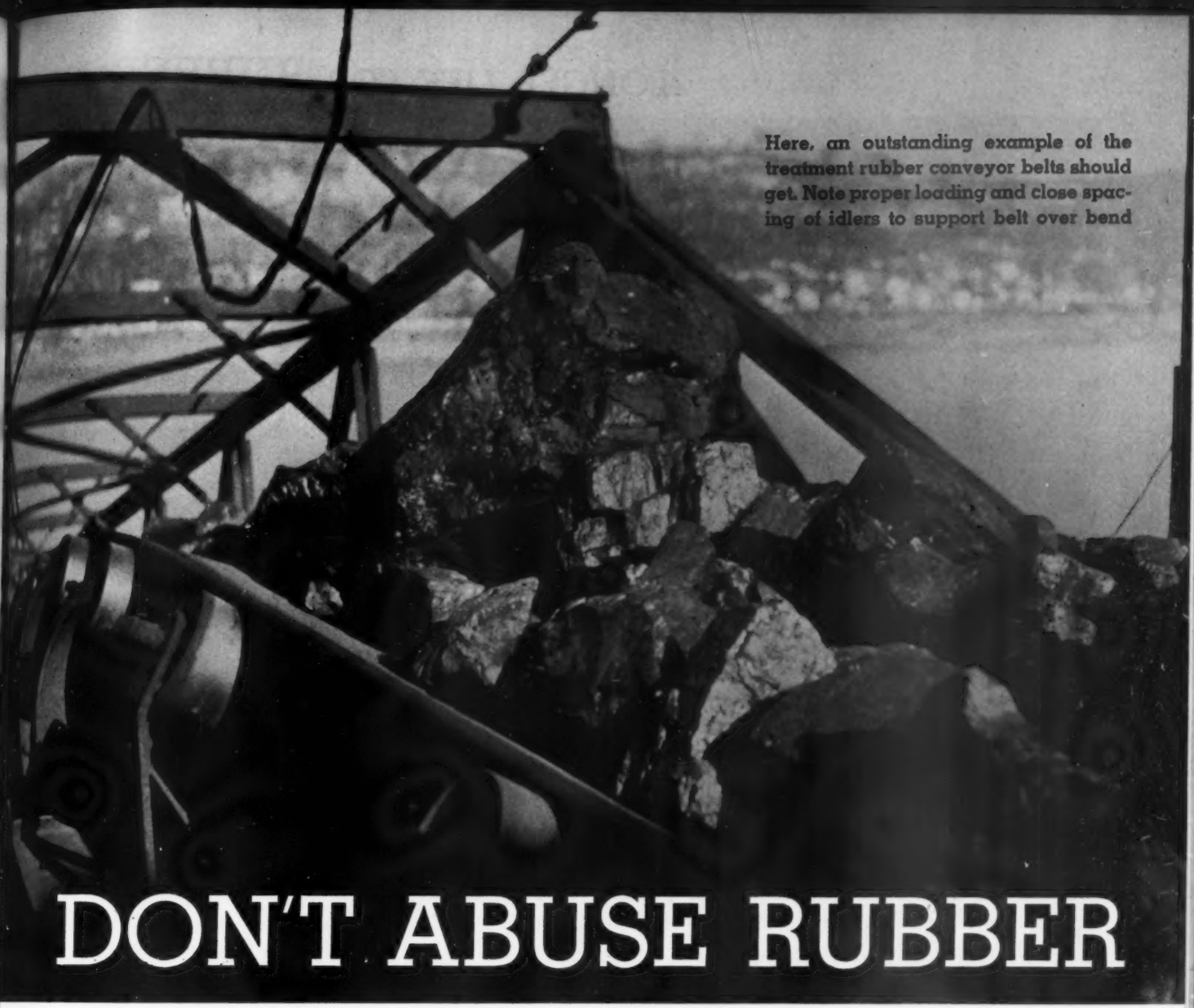
Adequate supervision over control of the system is vital. Valves are sometimes found to be closed after a fire has raged out of control. When to shut off sprinklers is one of the most critical decisions that has to be made during a fire. Allowing sprinklers to flow longer than necessary tends to increase water damage. Shutting them off too soon allows fire to flash up again, often with increased violence.

Whether to shut off sprinklers or let them run awhile is definitely a question to be decided only by someone who has had careful instruction and training and can exercise sound judgment in an emergency.

Keep Containers Rolling, Too

STANDARD OIL COMPANY of Indiana has added its name to the list of manufacturers who are urging customers to return promptly the metal containers in which various products are shipped.

No argument is needed to demonstrate that such appeals are soundly based and ought to be heeded. When empty oil or grease drums, gas cylinders, and other metal containers are allowed to stand idle they represent just so much good metal that is prevented from doing its full part in the war program.



Here, an outstanding example of the treatment rubber conveyor belts should get. Note proper loading and close spacing of idlers to support belt over bend

DON'T ABUSE RUBBER

How to Prolong Its Life

WILLIAM S. RICHARDSON
General Manager, Industrial Products Division, The B. F. Goodrich Company

THE WORLD'S LEADING rubber-growing area has been cut off from us since December 8, 1941. Our government, acting swiftly, has placed drastic restrictions on the manufacture and sale of rubber products.

To every industrial plant in the nation, from the smallest parts manufacturer to the largest steel mill, these restrictions will mean revision of production plans, alteration of expansion moves, and greater attention to the machinery now in use.

Rubber is a vital part of the nation's productive facilities. Without it the war program would slow down to a halt. To management this fact means just one thing: Every care must be taken of *all* the rubber equipment now in use.

It is not only a patriotic obligation, it is also good, sound economy. In the past it was often considered easier to purchase new material than to take the necessary steps to prolong the life of mechanical rubber goods. Today, and in all probability for several years to come, such conservation is a sheer necessity.

Actually, the problems we now face because of the cutting off of rubber shipments from Malaya and the Dutch East Indies, are not insolvable. For a long time, and particularly during the past ten years, the rubber

industry has devoted ever-increasing attention not only to the development of new rubber mechanical goods, but also to lengthening the life of such equipment.

As new products were installed, instructions have been given on use and care. On occasion these instructions have not been closely followed for one reason or another; the fact remains that the rubber industry has both learned and taught.

Careful observance of the precautions outlined in this article should assure for industrial rubber products at least 10 percent longer wear and service life, and safeguard production efficiency.

Plans are being rushed for large-scale production of synthetic rubber. Available supplies will also include maximum production of reclaimed rubber and a modest amount of rubber obtained from guayule, a rubber-bearing shrub.

These new supply sources are expected to supply, in time, adequate production; meanwhile, however, we shall have to bridge the gap.

Therefore, if your plant is making non-defense goods, you may not be able to buy new equipment to replace that now in service. Under the circumstances of priorities, you might have difficulty in quickly obtaining necessary mechanical rubber products even if your plant is operating full-time or part-time on defense work.

These Are the Facts of Rubber Life

EXPOSURE TO SUNLIGHT deteriorates natural rubber rapidly and is a frequent cause of breakdowns. Therefore it is important that all rubber products—hose, belts, tires, clothing, etc.—be protected from the sun's rays wherever possible

OIL, GASOLINE, GREASE, and other products with a petroleum or vegetable oil content are harmful to rubber. These materials destroy rubber by eating into it, by rotting it, causing it to swell and lose its elasticity. Whenever possible to avoid it, oils and greases should not be permitted to come in contact with rubber; if it does happen, the rubber should be cleaned and washed as quickly as possible. There are special solutions for this purpose, but even soap and water are useful

ABRASION DESTROYS RUBBER, as it does everything else. In many instances it is possible to cut down frictional wear by checking all equipment over which rubber travels or which it touches, and making needed adjustments

HEAVY OVERLOADS on tires, conveyor belts, transmission belts, and other products cause strains that break down rubber and fabric, shorten their life. This condition can be avoided by strict observance of loading rules and closely adhering to operating regulations provided with the equipment, or easily obtainable

EXCESSIVE HEAT OR COLD also destroys certain important properties of rubber, especially when a rubber product is subjected to severe heat (exceeding 150 degrees Fahrenheit)

CONSTANT BENDING AND FLEXING tend to shorten the life of many industrial rubber products, especially those not specifically designed for such service

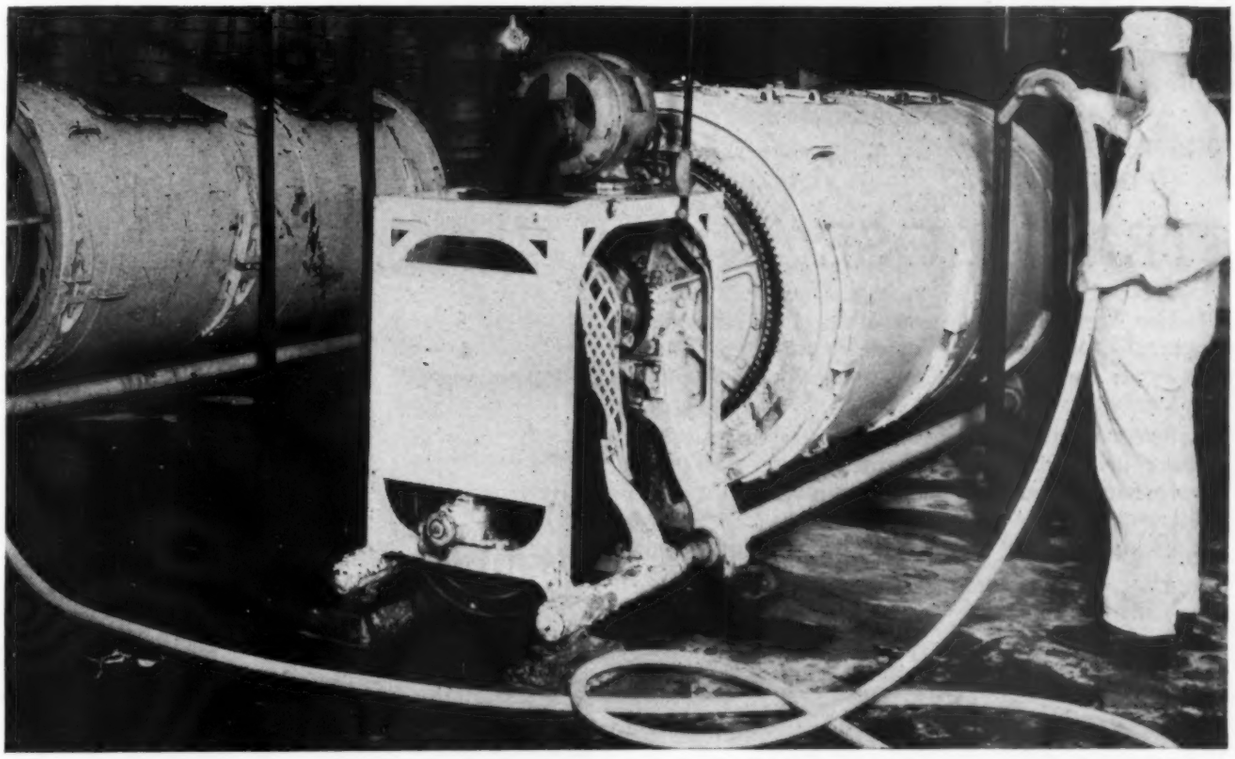
CAPACITY TO STRETCH and return to its original shape is the most valuable property of rubber. It must be remembered that a rubber article which is kept under constant tension is much more susceptible to deterioration than the same rubber article at rest. For example, a hose if closed at the end and constantly full of water or air at high pressure will have only a fraction of the life of a similar piece of hose that is used intermittently

RUBBER IS NOT COMPLETELY WATERPROOF—contrary to common belief. Hose and belting constantly drenched with water gradually absorb some of it. The moisture penetrates to the cotton reinforcement and sometimes mildew and rotting can destroy the structure

HOSE

"TURN OFF WHEN NOT IN USE"

. . . . but not like this ◊



Outside cover of hose used for wash-up service and exposed to fats, as in a creamery, should be washed daily

WATER HOSE

1. Avoid bending, kinking, dragging over rough surfaces of any kind.

2. Do not kink to shut off flow of water. Always use valve or shut-off nozzle.

3. Whenever possible, supply a reel on which to wind the hose when not in use.

4. Store water hose in a protected place away from the sun and weather.

5. Drain water from hose when not in use to avoid penetration of water to the reinforcing cotton fabric.

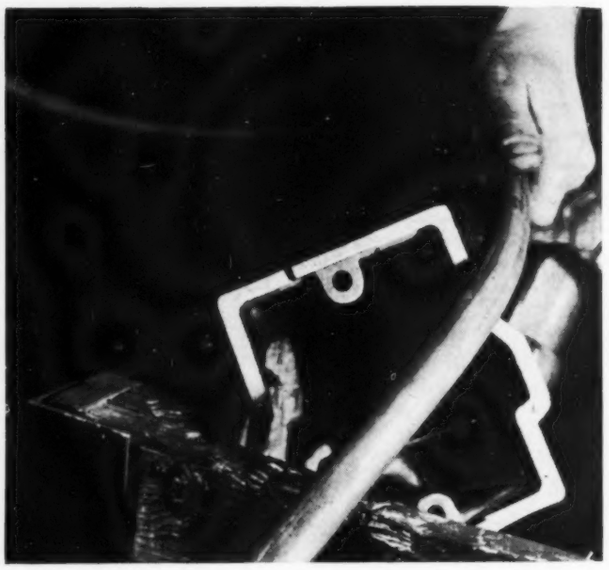
6. Do not use at higher working pressures than recommended by the manufacturer.

7. When hose must be used under excessive pressures, avoid constant use. Periodic use for short periods will give longer life.

8. Connection to valve should be arranged so that hose hangs down. A constant bend near the coupling, with weight of hose putting tension on rubber, will seriously shorten hose life.

AIR HOSE

1. Buy the best grade of hose available, with the tube recommended to resist oil and heat and the cover to resist abrasion
2. Hold exposure to heat and oil to minimum
3. Select hose with some firmness of body to help resist kinking and cracking
4. Keep compressors in good repair, particularly the after-coolers
5. Keep the hose cover clean and free from oil; prevent disintegration
6. Use care in handling air hose. Do not drag it over sharp objects
7. Do not permit hose to catch on equipment; it may be subjected to a severe stress when an attempt is made to release it
8. Do not use hose as a tow rope to pull compressors or tools of any kind
9. High-pressure-type couplings having clamps that fasten onto the shank as well as to the hose give the best results
10. When rubber hose is not in use, store it in a cool, dry place

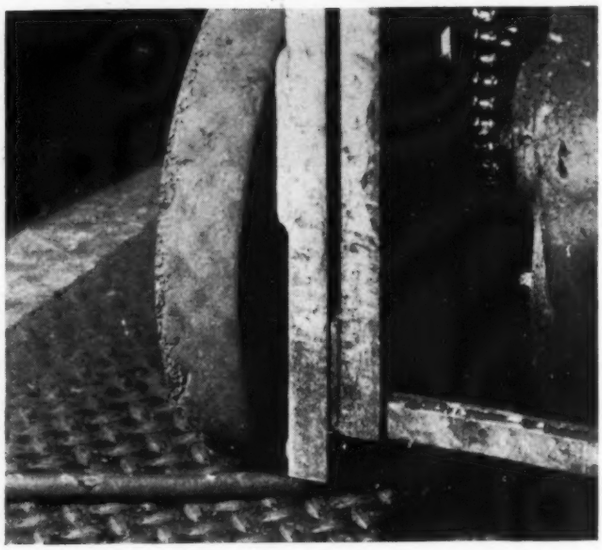


Don't drag hose of any kind over sharp objects

STEAM HOSE

1. Use hose only within recommended maximum temperatures and corresponding steam pressures. Cotton fails sooner than rubber. Consequently a six-ply hose lasts longer than five-ply
2. Select a hose of a diameter satisfactory to resist the pressure involved. A small-diameter hose will stand more pressure than a large-diameter hose with the same number of plies
3. Use the shortest practical length
4. Hose with one end open will stand higher pressure than when both ends are closed
5. Guard against hose becoming plugged, since pressure can back up and cause undue strain or failure of fabric plies in carcass
6. Use saturated steam when pressure conditions are the same, in preference to superheated steam, since the latter is more damaging to hose
7. Prevent alternate freezing and heating
8. Avoid frequent flexing and bending
9. Use hose with extra cover thickness, if it is subject to excessive abrasion conditions such as dragging over concrete floors, or against the sharp edges of machinery or equipment
10. When hose is used for wash-up service in packing plants, creameries, ice cream plants, or oil refineries, use a hose designed for that service
11. One end of the hose should be open when steam pressure is turned off; quick condensation may cause tube to pull away from the carcass

Don't leave hose about for big feet to step on



Be sure power trucks don't run over your hose

12. Select couplings suitable for the pressures involved. It is desirable to use a type of coupling for steam hose that can be retightened after it has been in service for a time

13. Avoid exposure of hose to excessive heat; if unavoidable, use hose with a woven asbestos cover

14. Hose can be wire-wound to resist external wear and as an additional safeguard against expansion and excessive bending

15. When used for wash-up service and exposed to fats, grease, and oil, wash outside cover daily. Drain hot water from hose after using

FIRE HOSE

1. When a choice can be made, purchase hose with close-woven jackets, which wear longer and give fuller protection from abrasion.

2. Buy hose made with flat cure, since it folds naturally and places no strain on hose tube when racked or coiled. Since fire hose is racked or coiled 90 percent of its life, flat curing actually lengthens the life of the hose 20 to 50 percent. It also permits handling with less effort than round-cured hose.

3. If stored in racks, use as few folds as possible and change position periodically to relieve strain on rubber tube at same point.

4. Dry hose after use, to avoid mildew.

5. When new hose is received, remove from packing cases as soon as possible, and loosen coils to relieve strain on rubber tubes.

6. Run water through unused hose periodically to retard oxidation of the lining. Be sure to drain and dry thoroughly after such operation.

7. If exposed to oil or grease while in service, be sure hose is cleaned off before stored.

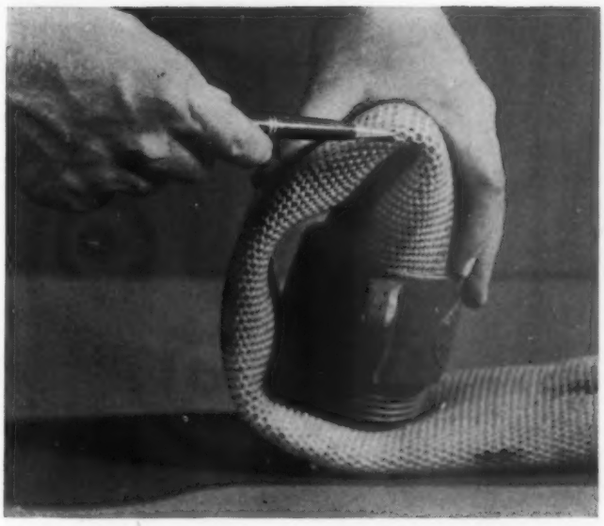
8. If the jacket is subjected to gasoline, wash thoroughly as fumes can loosen the adhesion of the tube from the cotton jacket.

9. Check standpipe valve at intervals to eliminate leakage of water into the hose, especially in winter when freezing may occur.

10. Care must be taken to protect jackets from coming in contact with acids. If contact occurs, wipe or brush off lightly, as soon as discovered, with a 5 percent solution of washing soda, followed by a thorough washing with plain water.

HOSE COUPLINGS

Couplings must be properly attached because suitable care in this respect will add to the life of the hose, and make it safer to use. Compressed air and steam are very dangerous, and many accidents occur because of improperly attached couplings and fittings. Precautions



When fire hose breaks, it breaks at the folds

that apply to hose couplings include the following:

1. Remove all burrs or sharp points from stem of couplings or nipple. End of stem should be rounded off so as not to cut the tube.

2. Coat the inside of the hose with soap solution or rubber cement. Apply it also to the shank before inserting, but do not let the cement dry before inserting. Never use oil or grease.

3. If the stem of the coupling is too large to enter the hose, do not cut away any portion of the tube to make the hole larger. It is preferable and safer to purchase couplings with proper-sized stems, or turn stems down in a lathe.

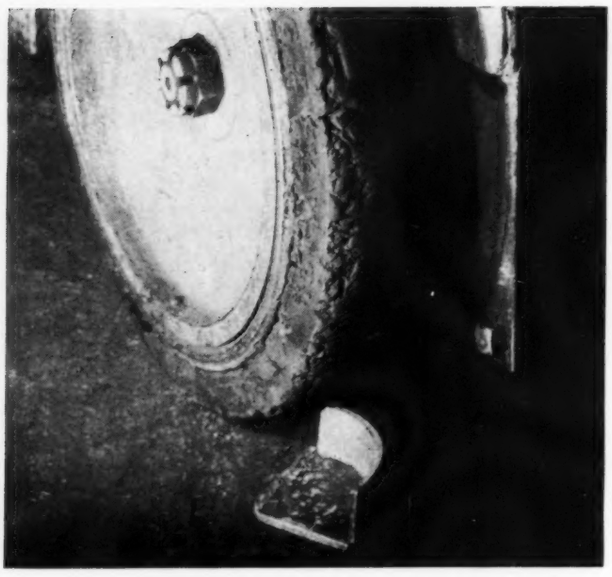
4. When attaching couplings of seat or socket type, cut hose as square as possible, to allow end to seat properly. This precaution will prevent fluid from leaking between tube and cover and wicking its way through hose carcass, causing premature breakdown between component parts. If service conditions warrant, use hose with capped ends (rubber covering over ends of fabric), or apply several coats of rubber cement to the exposed fabric. This will eliminate wicking, or retard its progress.

5. Do not drive a coupling into hose with a hammer or mallet. Force it in evenly and squarely after lubricant has been applied. Place the coupling in a vise and push the hose over the sleeve.

6. Use clamps of the proper size and draw them up tight. It is preferable to leave a small space between the lips of the clamp for future taking up of the clamp. To secure the best results, a special hose clamp vise should be used, whereby the clamp is forced together by special jaws that grip the lugs on the clamp.

7. To couple wire-wound hose, turn the end of the wire at right angles so that it follows the hose and can be clamped down securely.

8. After hose is coupled, mount it in such manner that the position in which it hangs or is suspended does not cause strain or make the hose assume an unnatural position. Hose should invariably be suspended in a vertical position.



Overloading makes hard tires easier to cut

TIRES

So-called hard rubber tires are primarily designed to withstand harder and longer usage than pneumatic tires, but they are vulnerable to certain abuses. Wet rubber cuts much easier than dry rubber. Therefore it is always advisable to avoid chafing against curbs, rails, and other obstructions when the tires are wet, although such action even when the tire is dry can cause serious harm.

Overloading solid tires is extremely harmful, just as in the case of pneumatic casings. Excessive pressure on solid tires causes the rubber to expand beyond the confines of the steel rim, stretching it and making it especially susceptible to the cutting action of any sharp object with which it comes in contact. Actually, the effect is much the same as stretching rubber beyond its elastic limit.

It is advisable to see that floor-washing solutions do not contain oils; tires subjected to oils become soft and spongy. They are then susceptible to rapid tread wear, cutting, and chipping, resulting in premature failure.

Wheelbarrows, hand trucks, and trailers using solid-type tires are often subjected to a wide range of conditions. These tires will give longer and more efficient service if they are treated in much the same manner as pneumatic tires.

Overloading is directly or indirectly the cause of a large percentage of premature truck-tire failures. Normal flexing for which tires are designed, will go on almost indefinitely, without causing appreciable damage to tire cords. Overloading causes over-flexing, creates heat which weakens the cords and causes them to fail before full tread mileage is obtained. Overloading also results in rapid tread wear because it increases the load on each square inch of tread in contact with the road. Uneven wear also results because the tread is distorted and cannot move naturally against the road.

Easiest way to determine tire loads is to weigh the loaded vehicle on a platform scale, first the front wheels, then the rear. If a platform scale is not available, approximate wheel loads may be obtained provided the weight of the empty truck is known and the way in which the empty weight is distributed between the front and rear axles. The amount of pay load carried on each axle is then added to the empty weight per axle.

Either too much or too little air decreases tire mileage. Over-inflation reduces deflection and tread contact area. It increases tension and strain on cords so that when an object is struck, the cord body is bruised much easier than when the proper air pressure is maintained.

Under-inflation affects tire life in the same way as overload. It increases the flexing in a tire and results in excessive internal heat and probable early failure. Fast, uneven tread wear is the result of under-inflation caused by scuffing and wiping the edges of the tread.

The following rules summarize what every tire-user should keep in mind in order to conserve industrial as well as passenger vehicle tires:

1. Maintain recommended or rated air pressures at all times.
2. Check the air pressure after a few miles of service whenever a tire is changed.
3. Do not run a tire constantly on the same wheel; shift tires from wheel to wheel every 5,000 miles at least, to insure even wear.
4. Keep safe tires on all wheels—a blowout destroys a complete tire.
5. Don't take corners at high speed; that practice wears tires faster than anything else.
6. Never jam on the brakes—except to prevent an accident.
7. Have wheel alignment, front and rear, checked regularly.
8. Inspect tires carefully from time to time.
9. Don't drive too fast on hot, dry roads. High speed heats up tires and hastens deterioration and wear.

Do not park industrial trucks in a puddle of oil or grease. Both are poison to tires

10. Start up gently; spinning the wheels grinds off rubber.

11. Do not bump into curbs—no tire will withstand such abuse.

12. If a car or truck begins to steer queerly, it should be pulled off the road and the tires carefully inspected.

BELTS
CONVEYOR

How to care for a rubber conveyor belt can be better understood if the fundamental characteristics and functions of the two component parts—cotton fabric and rubber—are kept in mind.

Fabric supplies all the structural strength; it does all the work in supporting and pulling the load. Rubber supplies no structural strength. Cotton, however, is almost powerless to resist abrasive wear, cutting blows, rot, and corrosion. The rubber with which the cotton is covered and impregnated is 100 times more resistant to all these damaging conditions.

The two in combination, one supplying the strength, the other protection, have made possible the modern belt conveyor with all its savings to industry in the economical handling of materials.

Belts do not wear out carrying the load along the straightaway, if the correct belt is used and idlers are in good condition and properly spaced. Wear under such conditions is negligible.

The principal wear on a conveyor belt occurs at the loading points. An ideal loading chute is so located that the material leaves the chute moving in the same direction as the belt and as nearly as possible at the same speed. Loading at an angle with the travel of the belt not only increases abrasive wear on the cover but may also cause the belt to climb the idlers, resulting in damage to the edge. When necessary to load the belt from the side, the chute should be designed to deflect the fall so that the material discharges in the direction of belt travel.

The falling of lumps against the rubber surface is responsible not only for a large part of the wear, but also for cuts, gouges, and fabric breaks. The most common device to save this wear is a mechanical arrangement to permit fine material to fall on the belt first, thereby providing a cushion. This action is sometimes accomplished by a screen or grating on the bottom of the chute or by a grizzly. An inexpensive and effective method involves cutting a V-shaped notch in the lip of the chute.

Skirt boards are frequently a cause of excessive wear on the belt cover. They should not come in contact with the belt at any time, and should be set so that the space between boards and belt increases in the direction of belt travel, thus permitting pieces of material to work free rather than to become wedged against the belt and gouge the cover.

Rubber belts stand temperature up to 150 degrees Fahrenheit, and special hot-material belts are made to withstand higher temperatures. Any temperature in excess of 100 degrees, however, hastens oxidation of the rubber. Care should be taken, therefore, not to overheat the belt.

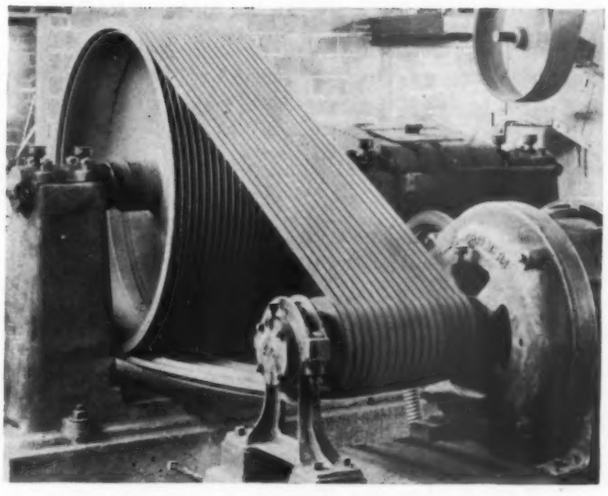
Cold does not have much effect on rubber, but lumps of ice can be as dangerous as rock. Wet belts have been known to freeze to the pulleys so firmly that the rubber was torn away when the conveyor was started. Whenever there is a possibility of the belt being frozen to the pulleys the system should be checked before starting.

Moisture can saturate the belt and get into the fabric below, thus causing rot and mildew. Acid, too, can cause the same, if not more serious harm. A mildew treatment is available, belts used under moist conditions should be so treated.

Inspect the belt fasteners frequently so that any wear can be detected before the metal fastener causes tears or rips.

Even small injuries to the belt must not be neglected. Temporary repairs are easy to make and will permit useful service until permanent repairs, such as vulcanizing, can be accomplished.

V-BELTS



Keep V-belts clean and free of grease and oil

When applying belts:

1. See that sheaves are lined up.

2. See that sheave grooves are clean, free from harmful burrs, and not unduly worn down.

3. Keep reasonable tension on belts. If necessary, adjust several times soon after being put into operation.

4. Do not force belts into the grooves: run take-up back sufficiently to supply the necessary slack.

When belts are in operation:

1. Check alignment periodically.

2. Keep sheaves and belt clean. In particular keep them free from oil and grease.

3. Keep take-up adjusted to reasonable tension.

4. Don't leave tools, bars, or other material where they might fall into drive and break belt.

5. Don't expect the drive to pull heavy overloads for long periods of time.

6. Protect the belts from the direct light of the sun while the drive is in operation.

CLOTHING

1. Do not store folded or under pressure. Garments should be hung up and kept free from pressure of any kind when not in use.

2. Do not expose wearing apparel of any type, including footwear, to excessive heat or sunlight. Drying out rubber footwear or shoes with rubber heels and soles, by placing them close to heaters or stoves, shortens their life.

3. Before storing any rubber wearing apparel, be sure that it is free from all dirt particularly oil, grease, or paint. That calls for a thorough cleaning before storing.

4. When storing rubber footwear in particular, be sure that temperatures are normal and the footwear is not subjected to pressure of any kind.

MATS

Rubber mats and mattings are widely used in industry and in some instances are essential to safety. Breakdown of a rubber mat is usually not so serious as a break in a conveyor belt or a hose; care should nevertheless be taken to avoid excessive wear. In all probability future production of matting will be held to a minimum. These precautions are recommended:

1. Unpack mats as soon as received to avoid curling and permanent set. Roll out flat.

2. Do not attempt to force mat into place. Trim if necessary.

3. Be sure mat lies flat, and that the floor is clean and as smooth as possible.

4. Avoid placing mats close to steam pipes or excessive heat.

5. Do not let bottom of doors drag on mats. If necessary, have doors adjusted or cut off to give proper clearance.

6. Clean regularly with broom or brush and mop with clean water.

7. Avoid cleaning solutions with which you are not familiar.

8. If a dirty-white coated appearance develops from lime in hard water, scrub with soap and water, preceded by a good scrubbing with some mild scouring powder.

9. When removing mats, avoid sharp bending and the possibility of being stepped on, if folded over, and becoming broken.

10. When cleaning, do not hang mats over sharp edges or hot radiators.

11. Keep floor under mats or matting dry, especially if mat is made with burlap or fabric back, to avoid mildew. If mat gets wet on bottom, turn over until it is dry.

12. Do not roll trucks, or pull heavy furniture or other objects, or drag cartons or boxes, over mats.

13. Avoid outside exposure as much as possible. Protect from sunlight and heat.

14. If gasoline, oil, chemicals, or food products are spilled on mats, clean thoroughly as soon as possible.

LININGS

1. Inspect linings periodically, and if any portions are found to be in questionable condition, report them to the manufacturer.

2. If equipment is not in use, prevent deterioration by direct sunlight and other agents by protecting it in a suitable way. In general, it is good practice to leave the solution usually handled in the container while not in use. Never fill the container with water. This practice could speed deterioration of certain grades of rubber.

3. Take necessary precautions to prevent mechanical abuse. It can often be accomplished by the use of wood, brick, lead, or alloy bumpers or ledges. Bear in mind that rubber linings are for corrosion resistance and should not be expected to give structural strength.

4. Avoid extremely low temperatures or quick temperature changes. These conditions have been known to damage rubber linings, especially hard rubber.

5. Do not change service conditions radically without first consulting the supplier of the rubber lining. Such changes are sometimes detrimental to certain types of rubber.

6. Keep the unlined portions of tanks well painted, to prevent corrosion from the outside due to splashing or fumes.

7. If the liquid handled must be heated, avoid localized heating. It will cause rapid deterioration of the rubber in that area. Prevent impingement of steam on the rubber.

8. If mixing of liquids in a tank develops heat, provide proper agitation to prevent excessive temperatures in any one place.

9. Keep oils and solvents away.

10. For maximum life, rubber linings should not be subjected to temperatures over 150 to 180 degrees Fahrenheit, depending upon the type of lining. If temperatures can be reduced, the life can be further increased.

Faster, Slower With Multispeed Motors

When machines must be driven at more than one fixed speed, multispeed motors are one answer to the problem of providing two, three, or four speeds.

R. B. TEMPLE, Industrial Department, General Electric Company, Schenectady

Robert B. Temple was graduated in electrical engineering from the University of Colorado and immediately entered General Electric's test department at Schenectady, where he was assigned to the testing of industrial control apparatus. In 1939 he was transferred to the industrial control engineering department, specializing in the design of multispeed control. Temple's main hobbies include photography, golf, and bowling

ANY NUMBER OF SPEEDS are theoretically possible with multispeed motors. As a practical matter, however, these motors can be designed for only two, three, or four speeds. Four speeds with one motor is maximum.

There are three general methods for obtaining these various speed combinations that involve winding the motor in one of the following ways:

1. Use of a single stator winding with coils so arranged that they may be connected to give two different pole combinations and, therefore, two different speeds, one speed being half the other. This is the consequent-pole type of winding.

2. Use of a separate stator winding for each speed. Separate windings must be used where the speed combinations are not in the ratio of 2 to 1. This is the separate-winding type of motor.

3. Combinations of these two methods. By using a combination of consequent-pole and separate windings, more than two windings are seldom necessary for any desired speed combinations.

Multispeed motors are also classified as to type in accordance with the torque characteristics. Hence, there are three general types of such motors, each with a different torque characteristic. These types are:

1. Constant-torque motors, which deliver practically constant torque regardless of speed. This type of motor is used where the horsepower required increases with the speed. Typical applications are conveyors, compressors, and dough mixers.

2. Constant-horsepower motors, which deliver practically constant horsepower regardless of speed. These motors are used, where the load is such that as speed increases the torque decreases. Lathes, gearcutters, and other machine tools are typical industrial applications.

3. Variable-torque motors, which give the characteristic of variable torque and horsepower with speed variations. These motors deliver torque that decreases about as fast as speed decreases. Hence this type of motor is applied where both horsepower and torque increase as the speed increases. Draft fans and centrifugal pumps are common examples.

For a given horsepower rating and speed combination constant-horsepower motors are the largest in size of the three types. The size of a constant-horsepower motor is com-

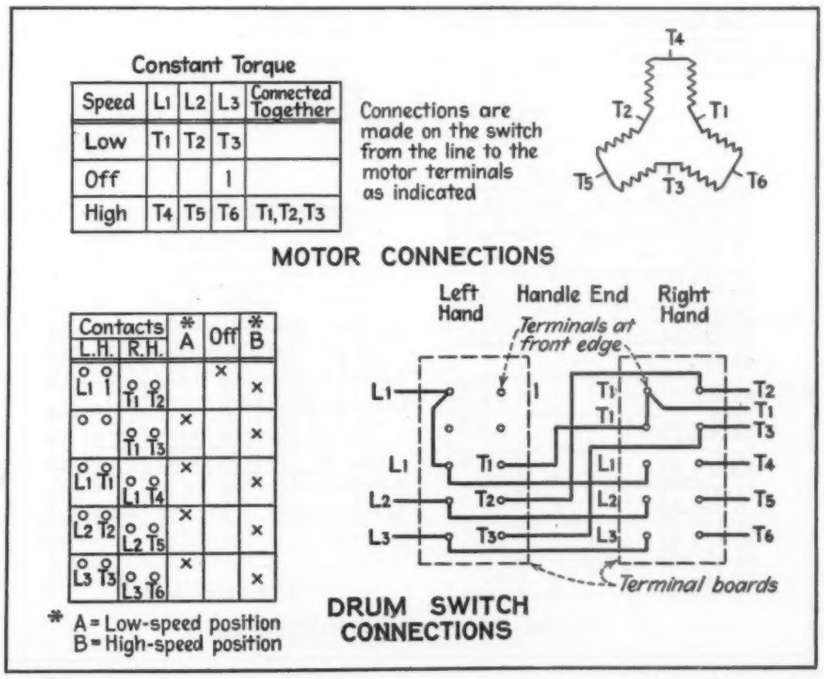
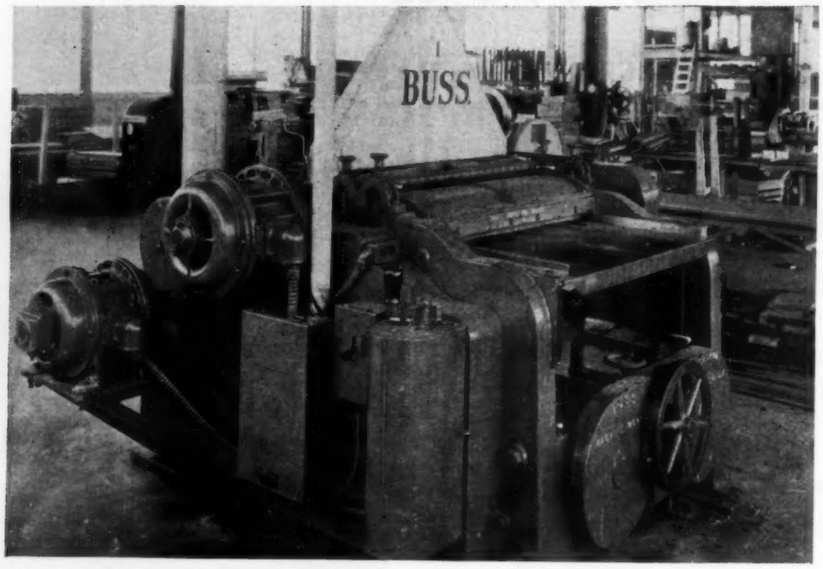

Constant Torque
Speed | L1 | L2 | L3 | Connected Together
Low | T1 | T2 | T3 |
Off | | | 1 |
High | T4 | T5 | T6 | T1,T2,T3
Connections are made on the switch from the line to the motor terminals as indicated
T4
T2
T1
T5
T3
T6
MOTOR CONNECTIONS
Contacts L.H. R.H. | * A | Off | * B
L1 1 T1 T2 | | × | ×
T1 T3 | × | | ×
L1 T1 L1 T4 | × | | ×
L2 T2 L2 T5 | × | | ×
L3 T3 L3 T6 | × | | ×
* A = Low-speed position
B = High-speed position
Left Hand
Handle End
Right Hand
Terminals at front edge
L1
L2
L3
T1
T2
T3
T4
T5
T6
Terminal boards
DRUM SWITCH CONNECTIONS

Figure 1. Here is a typical connection diagram for a drum switch for non-reversing control of a two-speed, single-winding motor



The feed on this woodworking machine is driven by a four-speed induction motor, with drum-type controller

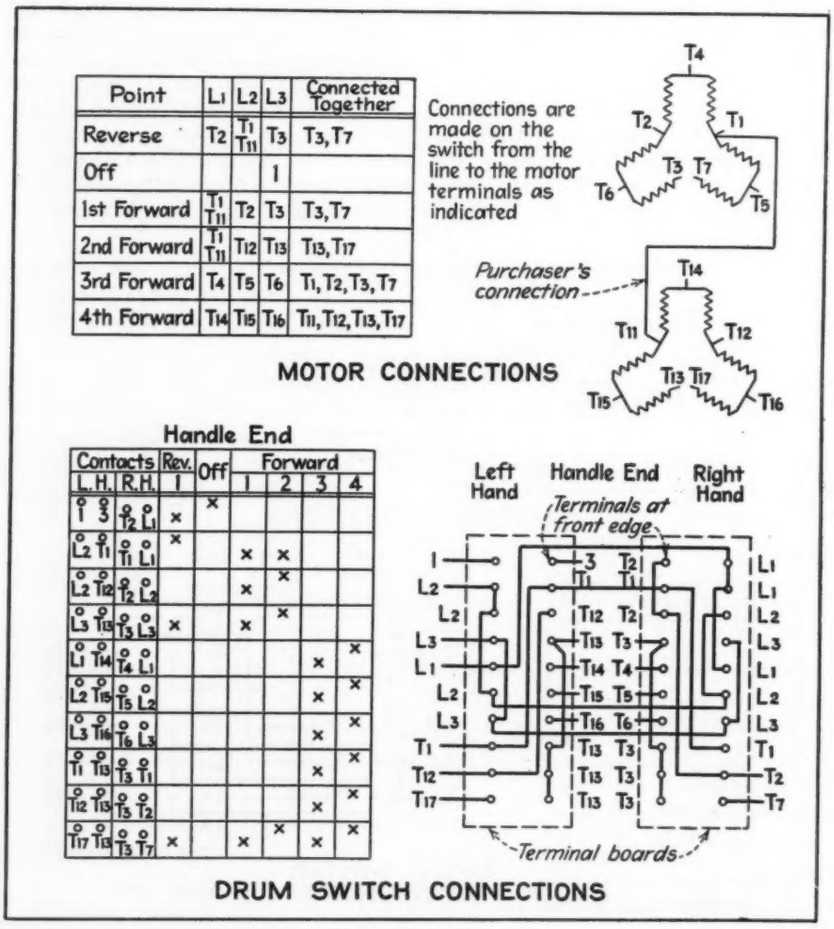


Figure 2. A drum switch and four-speed motor are connected this way. The control provides low-speed reverse

parable to that of a single-speed motor of the same horsepower rating at the lowest speed.

Controls used with multispeed motors are quite simple and easy to understand although at first glance they may seem to be rather complicated. Basically, a multispeed control consists of a separate set of contacts or contactors for each speed. It may be manually or magnetically operated.

Manual multispeed control generally involves the use of a rotating-cam-type drum switch. Manual drum switches may be had for either reversing or non-reversing, two-, three-, or four-speed service.

These drum switches are usually arranged so that movement of the handle from the Off position gives successive speed steps as required. The windings of the motor are connected in proper sequence from one speed to the next through different contact and cam arrangements as necessary for the particular motor involved. Figure 1 shows a typical connection diagram for a manual multispeed drum switch. The connections shown are for non-reversing control of a two-speed, single-winding motor.

From the diagram it will be seen that when the switch is moved from the Off position to the A or Slow-Speed position, the motor is connected properly for operation at the slow speed. The three lines *L1*, *L2*, and *L3* are connected to *T1*, *T2*, and *T3* respectively to give the proper pole combinations for running at the low speed. Likewise, when the switch is moved to the *B* or Fast Speed position, *L1*, *L2*, and *L3* are connected to *T4*, *T5*, and *T6* respectively, while *T1*, *T2*, and *T3* are connected together to give the proper pole combination for operation at the high speed.

The same general scheme of manual control is used for three- and four-speed combinations. Figure 2 shows the connections for a four-speed motor and drum switch, with low-speed reverse.

As the operator moves the drum switch handle from the Off position to the right (referring to the diagram) to the speed desired, the motor is connected first for the correct pole combination to give low speed, next for second speed, and so on until the desired speed is reached. This arrangement, in effect, provides sequence acceleration at a rate depending upon the speed with which the operator moves the handle from one position to another. Positive and dependable manual speed selection is obtained through the use of this type of multi-speed control.

One factor in the application of

manual multispeed control should be noted here. Where this type of control is used for motors rated above approximately 10 horsepower, it is necessary to use a magnetic line starter ahead of the drum switch, to make and break the line currents. Multispeed drum switches in the larger sizes are not designed to rupture line currents. In these sizes they are used for pole-changing only.

Where a magnetic line switch is used ahead of the drum switch, an interlocking contact is supplied on the drum switch to prevent opening line currents with the manual switch.

A magnetic starter has several advantages over the drum switch. Undervoltage and overload protection are provided, which on most applications is very desirable. For this reason many applications call for a magnetic switch, even on the smaller sizes.

Magnetic control is inherently more flexible than manual control. It is easier in most instances to provide magnetic control for applications requiring special inclosures for locations calling for dust-tight, watertight, weather-resisting, or explosion-proof types of housings. In addition, it is easy to obtain automatic or remote operation with a comparatively simple standard magnetic control panel. Practically any application requiring two or more different speeds can be solved with a proper selection of the magnetic control scheme.

Figure 3 shows the elementary diagram for a standard-type two-speed magnetic controller.

Note that electrical interlocking is provided through the back contacts of the pushbutton stations.

With the four-speed controller additional electrical interlocking is provided through the use of interlocks on the short-circuiting and line contactors. This arrangement insures against having more than one winding energized at the same time and provides for dependable and safe selection of any desired speed.

In Figure 4 is shown the elementary diagram for a standard four-speed magnetic control. The scheme of control wiring used here is typical for all straight pole-changing control for two-, three-, or four-speed motors. The operator may select any desired speed when starting from rest. When the motor is running on one speed, however, it is possible to select only the next higher or the next lower speed, unless the control is first thrown to the Off position.

For example, let's assume that the motor is running on the second speed. The operator may then select either the low or the third speed, but he cannot go directly to the high speed without first pressing the third-speed button or the stop button. This provision is accomplished through the use of the electrical interlocking on the line contactors and through the pushbuttons. Added safely is provided by this feature in that it acts as a reminder to the operator to accelerate the motor smoothly, step by step.

For high-inertia loads and other applications requiring automatic acceleration from the low speed to the speed selected, additional relays are added. This type of control provides automatic sequence acceleration, making it imperative that the motor accelerate smoothly through each preceding speed to the speed selected. Electric timing relays are added along with other necessary control relays to provide definite time acceleration from one speed to the next higher.

Accelerating-sequence control is often used also with machines that handle liquids or other materials and must be accelerated slowly and smoothly.

By the addition of a single timing relay to the standard starter, the control may be arranged so that it is possible to start only on the low speed. This relay is called a compelling relay, and its use is especially desirable where the starting of a machine directly on high speed would result in damage to the load or connecting machines.

Combinations of the various schemes of control previously discussed, providing accelerating-decelerating sequence operation, compelling-low-speed starting, and decelerating-sequence operation are sometimes used on special applications. Such control is usually of special nature and requires considerable engineering and specially developed control elements.

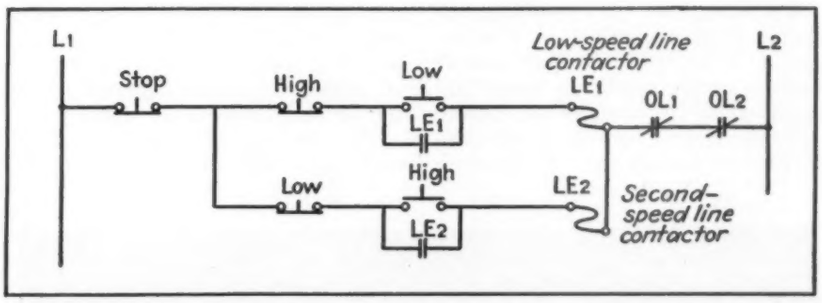


Figure 3. This is the elementary diagram for a standard, two-speed magnetic control, with electrical interlocking

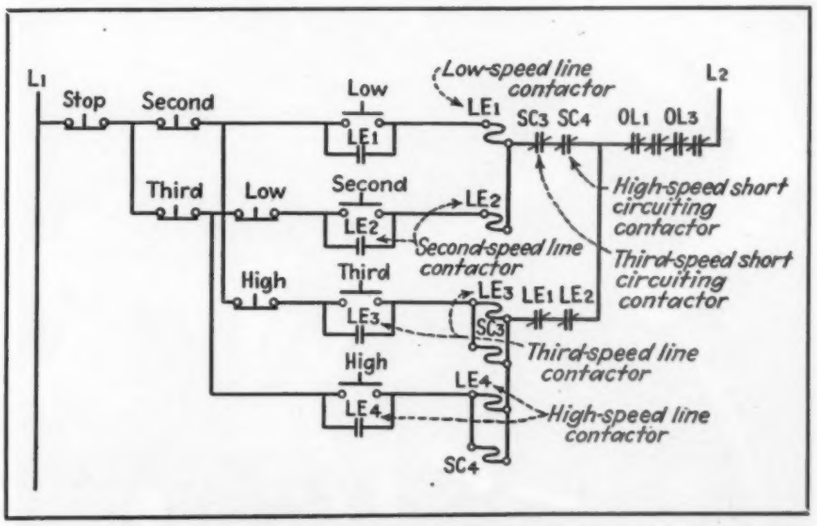


Figure 4. The wiring scheme for this standard four-speed magnetic control is typical of those employed for all straight pole-changing controls used with two-, three-, and four-speed motors

How to Get the Most Out of Your Air Circuit Breakers

No problem here beyond the skill of average maintenance personnel. Largely a matter of knowing what to look for, then looking for it regularly

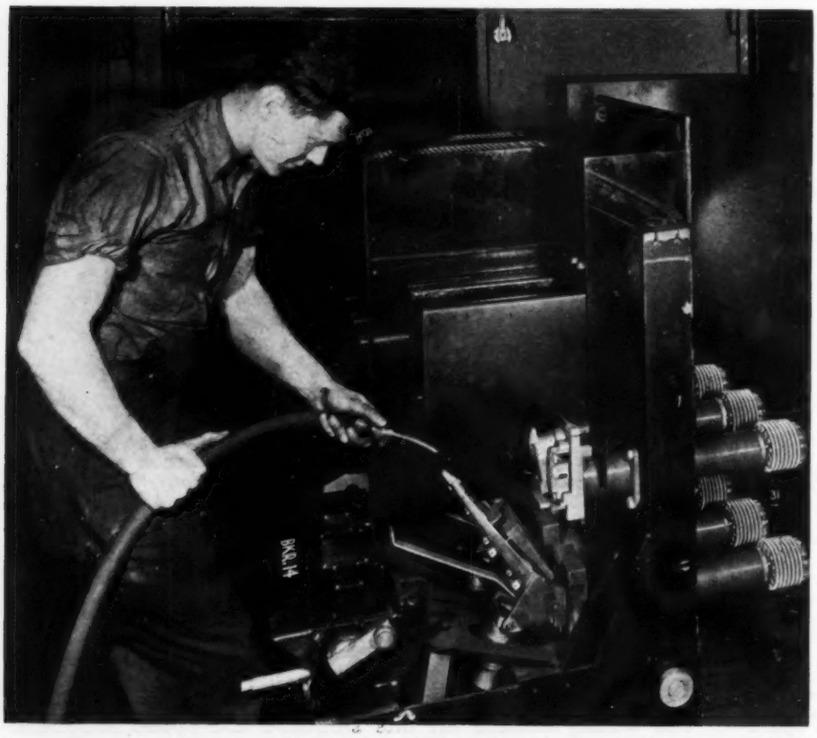
H. M. WILCOX, Section Engineer, Air Circuit Breaker and Protective Devices, Westinghouse Electric & Manufacturing Company, East Pittsburgh

ADVANCES in the switchgear art over the last few years, particularly for alternating current service voltages of 2,300 and upward, have introduced the air-insulated circuit breaker, which at the present time is rapidly supplanting the oil breaker for indoor service. This newer type of equipment may seem on the surface to present new maintenance problems. Basically, the end sought is the same; the work differs only in the way it is carried out.

Fundamentally, the function of any circuit breaker installed in a power circuit is to: (1) Conduct current from a supply source to some load point when its contacts are closed; (2) interrupt the flow of current when its contacts are opened; (3) maintain an insulating gap between the power source and the load point as long as the contacts are open.

Maintenance problems, then, are centered around: (1) Keeping the main current-carrying contacts in a condition to carry the current load without interposing excessive resistance with consequent overheating; (2) maintaining adequate surfaces on the arc-drawing contacts with proper follow-up movement to insure that the arc will be drawn at the right time and place when opening; (3) providing adequate insulation between all points of opposite potential when the breaker contacts are open.

Routine contact maintenance of both main and arc-drawing contacts presents no serious problems and involves substantially the same amount of work for either oil or air-insulated apparatus. The insulation upkeep is the same, requiring only a different approach. Generally speaking, operating experience over the last ten years indicates that, for the majority of normal switching applications, maintenance work for air breakers may be expected to be somewhat less than for oil breakers. For air breaker applications where operation is more highly repetitive, or where the duty is more exacting in other respects, the amount of maintenance will, of course, increase proportionately.



Compressed air is used to clean 2,500-volt air circuit breaker. Unit is easily removed from cubicle for inspection and cleaning purposes

In the oil circuit breaker, insulation between opposite potentials across the open contacts is supplied entirely by the body of oil in the breaker tank. A relatively simple oil-cup test discloses accurately the dielectric strength of this insulating medium—often its color and viscosity are sufficient warning—and a renewal of the oil body with a routing wiping of the bushings restores the breaker to a safe operating condition. With the advent of the air-insulated breaker, insulation maintenance assumes a different aspect, not immediately evident and in some cases not fully appreciated.

Modern circuit-interrupting devices used on air breakers are located in physically close relationship to the parting contacts, often enshrouding them more or less completely. In the absence of any fully enveloping liquid such as oil, materials for this shrouding must consist of organic insulating products such as hard fiber, phenolic resin products, and the like, sometimes with refractory inserts. Since their relation to the contacts is fixed, these materials must remain in position across the contact break while the breaker is in the open position. These organic insulating materials are subject to some deterioration—from settlement of dust, from moisture, from

Raised on a farm near Middletown, Conn., Howard M. Wilcox says he gleaned an education between working periods. Left farm and school at 18 to serve his apprenticeship at American Bridge Company's Berlin (Conn.) plant, later became a draftsman in the New York office. For 10 years in the employ of American Pneumatic Service Company. With Curtiss Aeroplane & Motor Corporation, Buffalo, during World War. And then, he says, the bottom fell out of the airplane business. So to Westinghouse in 1919. And there ever since. Member, A.I.E.E. For recreation he'll take a canoe. Or a walk through the fields with his dog. Wants his camera along in either case

carbonizing effect of the arc, or from combinations of all three just as the oil in the oil breaker is subject to deterioration.

The design engineer encountering this problem has chosen of the materials available those best suited to resist these forms of deterioration; avoided as far as possible the use of flat horizontal surfaces on which dirt may collect; provided heating elements to decrease the likelihood of moisture absorption; and developed his interrupting device to the point of arc extinction in a minimum of time in order to decrease its carbonizing effect. In addition, he has designed his structure to provide liberal creepage surfaces; many air breakers are capable of withstanding a potential test up to three or four times their service voltage when new.

The installation engineer may assist materially by selecting a location for the breaker that is: (1) Reasonably free from the collection of dust and dirt; (2) free from excess moisture conditions; (3) accessible for purposes of inspection and maintenance. Metal-inclosed switchgear with the breaker in a draw-out truck goes far toward meeting these requirements for air-insulated breakers.

Whether or not such breakers retain a safe margin of dielectric strength throughout their service life, depends on the maintenance accorded them. With the cause and extent of deterioration less easily determined than in the oil breaker, inspection should become a definite routine. Removal of dust and dirt may well be the first item. Compressed air, almost universally available, is the best medium for this work. Always waste the air for a few seconds to carry off any moisture that may have condensed in the piping system. See that the air stream feels dry to the hand before playing it on insulating material. Direct the air stream thoroughly over all surfaces and into all crevices.

If the interrupting device is of the type built up of plate material with open venting spaces between plates, direct the air stream through all the open spaces to remove any loose deposit due to arc action. As a matter of routine, this cleaning should be scheduled every 90 days until experience from observation indicates that for any given location this interval may be safely lengthened or perhaps shortened.

Air circuit breakers in general draw an arc on specially designed contacts which part in a long, relatively narrow space. Then the arc is removed magnetically or otherwise to an interrupting chamber designed to de-ionize the arc stream and build up sufficient dielectric strength across the open contacts to withstand the voltage supplied by the circuit tending to break down the contact gap. This space in which the arc is first drawn is ordinarily inclosed by fibrous or ceramic insulation or a combination of both.

A large percentage of circuit opening operations deal with relatively low current values, load currents, or magnetizing currents in which arc movement is slow, resulting in a deposit of combustion products on the insulating sides of this arc-drawing space. An occasional short circuit of higher current value tends to remove this deposit and assists in keeping the surface clean. The use of an air hose as previously described will further remove this deposit, but assurance that these insulating surfaces are in satisfactory condition can be obtained only by inspection. In most air breakers they may be inspected with the aid of a flashlight without removing the interrupting chamber from the breaker. Should some of the deposit still remain, a vigorous brushing will generally remove it, and scraping may be resorted to in extreme cases. Stiff wire brushes should not be used because of the danger of roughening the surfaces and encouraging increased deposits in the future. This item should be included in the routine schedule for removal of dirt.

Air breakers are often applied to motor-control or furnace-transformer circuits where current values interrupted are relatively low and the duty may be highly repetitive; breaker operations of from 10,000 to 25,000 per year are not unusual. Rigorous inspection should be made of breakers in such service every 90 days or every 5,000 to 6,000 operations.

If the interrupting device is of the

Table Showing Intervals Between Inspections Suggested for Varying Frequencies of Breaker Operation

Inspection Detail	*Normal 5 Operations per Day*	*Moderate 15 Operations per Day*	*Repetitive 30 Operations per Day*	*Highly Repetitive 60 Operations Upward*
Clean External Surfaces	3 months	3 months	2 months	Every 5,000 operations
Clean Arc Box-Insulation	6 months	3 months	2 months	Every 5,000 operations
Check for Short-circuited Gaps	Yearly	Yearly	6 months	Every 5,000 operations
Insulation across contacts	Yearly	Yearly	6 months	Every 5,000 operations
Inspect Contacts	6 months	6 months	4 months	Every 5,000 operations
Inspect Mechanical Parts	Yearly	6 months	6 months	Every 5,000 operations
Heaters	Under conditions of atmospheric moisture, heaters should be turned on when breaker is open for any extended period.			

built-up metal plate type dependent on gaps between the plates for insulation, these gaps should be checked with a bell ringer of 110-volt lamp to insure that none is "shorted" by metallic deposit. This check may be made on most breakers without removing the interrupting chamber; simply applying the test points to the edges of plates on the exterior of the chamber is sufficient. Shorts of this nature are usually caused by minute pellets or slivers of metal lodged across the gap and may be burned clear by passing a few hundred amperes at low voltage applied in the same manner as the test is made. The occasional short that will not burn clear by this process may be left, but if the number of such shorts amounts to 10 percent of the total number of gaps, the chamber should be dismantled and examined at the earliest opportunity.

Other forms of air breakers, and most air breakers in highly repetitive duty, may be subject to deterioration in forms not divulged by these checks. The means most universally available for determining over-all dielectric strength is the insulation resistance meter, and this instrument may well be used to determine the integrity of air breaker chambers, provided due allowance is made for its limitations. A study should be made of the particular breaker structure at hand to determine the points between which readings are desired. In general, one or both terminal connections may have to be opened, and on some types of breakers other parts may also require removal.

It should be borne in mind that readings reflect surface as well as internal conditions, and care should be taken that external surfaces are free from dirt and moisture. Readings taken while the insulating material is at or near ambient temperature are less liable to give misleading results. The manufacturer of the apparatus in question may be consulted for minimum readings below which the insulation should be regarded with suspicion. For breakers that include a safe gap of clean air between live parts of opposite potential, use of the insulation resistance meter will, of course, be superfluous.

It has been found that some industrial circuits are subject to voltage surge conditions—for instance, some types of electric furnace in conjunction with their transformers. Under these conditions, circuit breakers in service may unknowingly be subjected to transient voltages for which they were not designed. In the event of any inspection showing evidence of electrical attack on solid insulation, an investigation should be made to determine the conditions under which it occurred. If serious overvoltages are found to be present, steps should be taken to control them. The manufacturer of the apparatus involved will on request make recommendations covering any remedial measures that may be necessary.

Operator with insulation resistance meter is making routine check of "dielectric strength of insulation on 2,500-volt air circuit breaker" with interrupting capacity between 100,000 and 150,000 kva. All surfaces should be free from dirt and moisture before check is made

For Average Conditions

Given a full appreciation of the requirements and a routine program with fixed intervals for inspection, the air breaker presents no problems beyond the skill of average maintenance personnel. Mechanical upkeep is in line with most other types of industrial plant equipment, simpler than many. The care of contact parts varies in no essential feature from that accorded older types of circuit-breaker contacts over a long period of years, beyond the fact that the work may be lightened by the improvement in modern interrupting devices. It will be realized that the inspection intervals given here are for average conditions. These intervals may well be modified to meet service conditions of individual applications as experience is accumulated, bearing in mind that to secure best service and longest life any circuit breaker regardless of duty should be given a thorough inspection and check once a year.

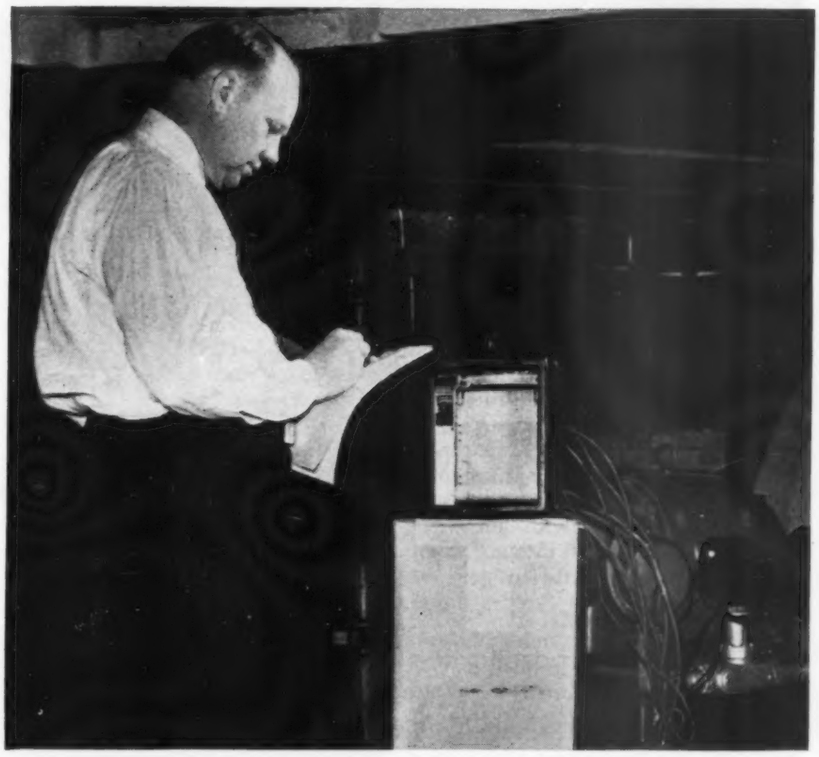
Instruments Win Our Battles

It matters little whether the problem is to detect conditions that are not right, or to find the cause of trouble that can't be foreseen — instruments quickly give the facts needed before a correct diagnosis can be made, or action planned

HORACE GREER, Electrical Foreman, Monsanto Chemical Company, Monsanto, Ill.

OVER THE YEARS, we have added a few electrical instruments as the need arose. Today, with a reasonably complete equipment of the more ordinary types, we wonder how we ever managed to get along with less complete instrumentation.

For example, there is the ever-recurring case with which every electrical maintenance man has had experience. A piece of production equipment—a machine, a conveyor, or what have you—is periodically running wrong, kicking out the protective devices, heating its motor, stalling for lack of power, or something equally annoying. The production supervisor is certain that nothing is being done wrong by his people, and the blame by default belongs to maintenance. Our usual recourse, in such a situation, is to hook on a recording instrument—normally a recording wattmeter.



The author takes a hand in finding out, by means of a recording wattmeter, whether this motor is the right size for the job

Chart Tells All

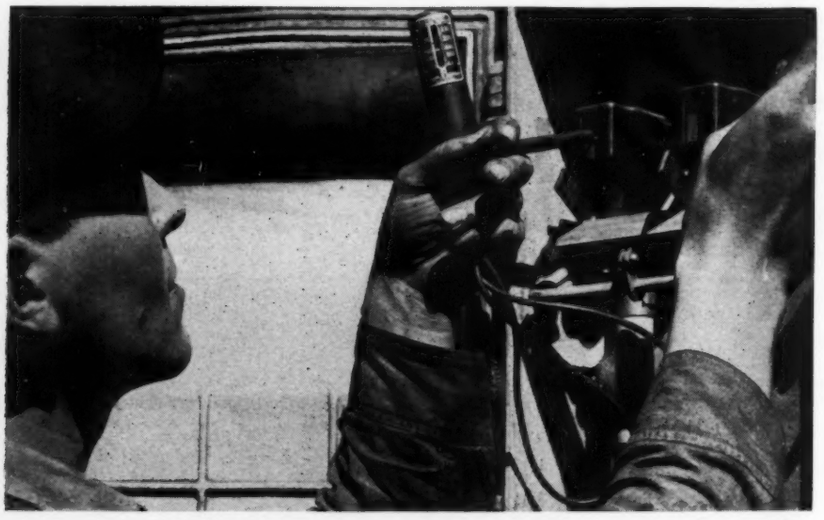
A 24-hour chart from this instrument usually tells enough so that it does not require a detective to run down the cause of the spasmodic troubles. Suppose the stylus ran along within narrow limits for, say, the first 12 hours. Then, suddenly, it jumped to a level far above this line—and held it until the relay kicked out. What it usually means is that somebody is not doing his job as he was instructed by his supervisor. He dumped an extra charge of material into the machine, failed to dilute the charge to the required consistency, or did any one of the hundreds of ingeniously incorrect things that workers sometimes do.

In another place, the instrument discloses that the overload condition is rather constant. We know that the job was all right for a 5-hp. motor when the machine was installed, because we checked it by instrument then. On questioning, it develops that the operation has been changed by increasing the density of a solution, or increasing the rate of flow. We patiently point out that you simply ought not to try doing a 7½-hp. job with a 5-hp. motor. Then we put in the right size of motor, and all is well again.

This sort of crime against a carefully engineered power installation occurs so frequently that in some cases we power an operation above its theoretical need, on the assumption that someone will at some time find a way to get more work running through the equipment without notifying the electrical department. This admittedly increases the cost of motors, and it distinctly impairs power factor. But it is the best insurance we have been able to devise against overloaded motors a year or two later.

On a machine with an automatic feed and continuous operations, it is often adequate to use an indicating instrument rather than a recording instrument. The momentary reading is usually all that is needed, assuming that the machine is set so that conditions remain constant. Our standard procedure is to have a try first with an indicating instrument on a motor that is reported to be misbehaving. Using the indicating instrument is a simpler, quicker job, and usually it reveals what is wrong. But if the indicating instrument does not tell us all we want to know or if we feel that it is important to know how the equipment is being used through all three shifts, we put a recording wattmeter on the motor for a minimum of 24 hours.

A survey of our instrumentation should presumably start with the pocket prong tester for voltage that every one of our maintenance electricians carries on his hip—all the



It's a rule in this company that electricians must check every circuit, to make sure that it is dead, before they start to work on it.

time, by direction. Our departmental rule is that an electrician must use this tester on every wire before touching it, for his safety and protection. Our men are instructed to work the wires cold, not hot; any time-saving that may be achieved by working with hot wires is lost by the occasional instance when even the wariest electrician gets set on his haunches by a careless move.

Many Purposes

In the electrical shop we have several 5-range load testers, which the men take out for a quick check on a line or a lead to a motor. The testers are used so often and for so many purposes that it is difficult to list them. The men take a reading first if the motor is running hot, if the condition looks like an overload, or if they want to know for a quick shot what load they have on a line. If they really want a complete test, of course, they hook on a recording instrument.

The instrument kit we use gives us the best all-around picture of what is taking place on a given circuit. Combining a voltmeter, ammeter, wattmeter, and power factor meter, this outfit makes possible a quick over-all survey. For one common use, our electricians periodically go around the plant with the kit to find out the conditions on the circuits. Here, for instance, is an incoming circuit to a department's machine line. An electrician hooks up the instruments and takes his readings.

He finds, let us say, that the power factor is too low on this circuit, and a quick size-up of the machines indicates the reason. There is on the circuit a total of 100 connected horsepower, but because these machines run on intermittent charges with the tendency to a lighter load a few minutes after charging, there is in effect a considerable overpowering, which is pulling down the power factor.

Adjacent is a line of machines which operate on steady load, powered with a minimum of overcapacity. So we bring in this additional 50 horsepower of load, which the wiring of the circuit is adequate to handle. Power factor is thereby brought up to an acceptable percentage, and our electrical situation is to this extent better than it was previously.

For a Run Record

We have recording ammeters and voltmeters, with the necessary transformers. These we put on a line to get a run record. Constant checking is necessary to keep our plant circuits in balance, because conditions in the production departments change steadily—almost invariably in the direction of increasing the loads. For instance, right now in one department a new machine is being set up. This piece of equipment has four sizable motors. Unless we know beforehand exactly how our circuits stand, all the way back to the powerhouse, we have to go in with our instruments to find out.

Again, a new department is added at the end of the plant most distant from the powerhouse. Our preliminary information indicates that it will use 25 new motors, for a total well up above 200 horsepower. An added load such as this requires careful checking of every line.

But when the new machines are in place and production starts, we must make still another check to find just what loads they are pulling, how their motors are loaded in respect to their ratings, how the entire set-up agrees with our preliminary planning. And, after the department has been running long enough to work out the bugs, we often make another once-over check-up.

In our plants, whether or not the same phenomenon is characteristic of other industries, the standard procedure for raising capacity consists of continuously opening bottlenecks. Here is a line of machines, with a production capacity of X barrels of product per hour. What limits it is, let us say, the capacity of the filter press. So a larger filter press is substituted, or an added press of small capacity is hooked into the line. Actually, the directly increased load from the increase in filter press capacity may be only 2 horsepower.

May Be Different

It would be easy for us to conclude that the existing lines can handle this load easily, and hence to pass up the entire change as electrically negligible. However, we know from experience that the situation may be much different. The new filter press capacity passes 1½ times as much as before, hence the output of the entire line is now 1½ X barrels per hour and the the electrical load is approximately 50 percent above what it was.

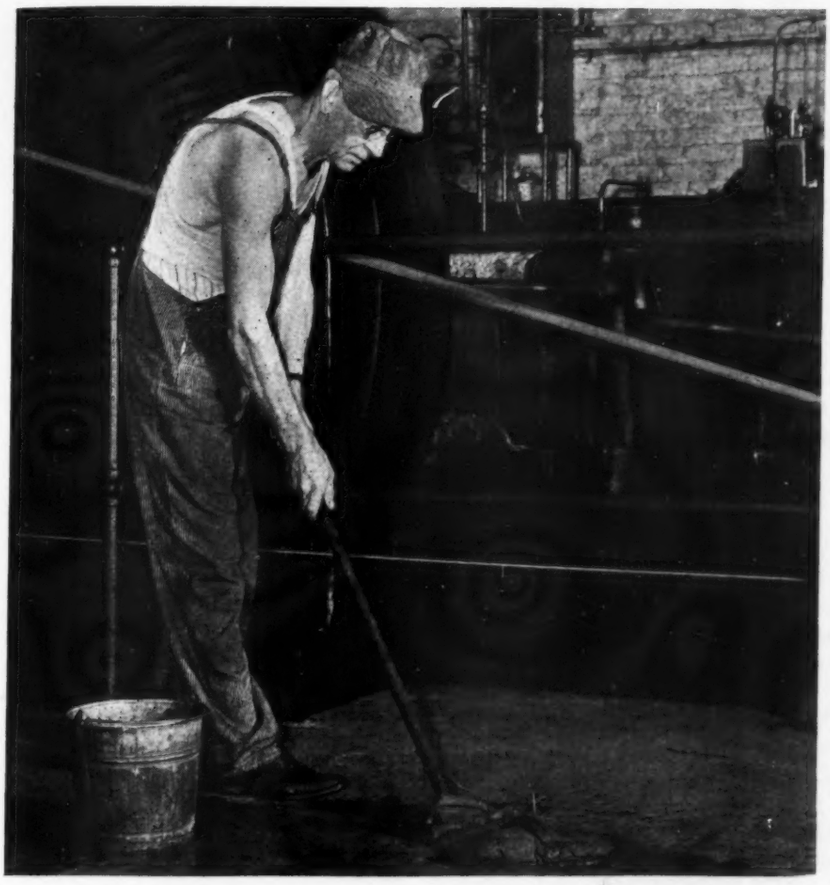
When, three months later, we find that a new centrifuge is being substituted in this line for the old centrifuge, we make another check of the circuits and of the motors. Actually, you see, the new centrifuge opens up what had been the secondary bottleneck, and we now get triple the original output, or 3 X barrels per hour from the line. Under this load, practically every machine may need a new motor, and we have to get more copper either in the form of heavier wire or by splitting up the circuits.

Thus it is essential in our plant that we keep continuously on our toes for changing conditions, and that we use our instruments to measure these changes so that we can adapt our service facilities to meet them. As was said earlier in this article, we wonder now how we ever got along on less complete instrumentation.

Right Cleaning Saves Floors

Dependable cleaning routines plus suitable cleaners not only keep factory floors safe for workers, but also increase the useful life of the floors

DR. R. W. MITCHELL, Technical Director, Magnus Chemical Company, Garwood, N. J.



Just sloshing a little water around isn't enough to keep factory floors clean. Each floor needs a special cleaner if the job is to be done right

FLOOR CLEANING is one of those plant operations that are usually regarded as a nuisance—unavoidable, of course, but not involving any need for technical control. The essential problem is the establishment of a dependable cleaning routine that will insure the maintenance of floors in a safe and presentable condition.

It is obvious that on floors where considerable foreign matter is deposited as a result of process operations, a definite sweeping or gathering routine should be established. It is equally obvious that such routines will not eliminate the need for specific cleaning of the floor surface.

It is safe to assume that choice of the cleaning method will be governed by the type of floor and the amount of labor or power required to do the cleaning job, depending on whether the cleaner is manual or machine. If floor cleaning machines are used, the question of the material used as a cleaning compound is important, because the mechanical scrubbing and brushing action of the machine will tend to intensify the harmful effects of compounds not suited to the kind of floor involved.

With manual methods, needless brushing and scrubbing can be equally harmful. Moreover, wasted elbow grease is always an expensive luxury. Hence it is important to consider the cleaner to be used not only from the viewpoint of its effect on the floor surface, but from that of its speed and thoroughness of cleaning.

There are modern cleaners, possessing the required properties, which are adapted to all the various types of floors met with in the industrial plant. It does not make any essential difference whether a cleaning machine or manual methods are used, except that, in general, somewhat less concentrated solutions of cleaners are required in machine washing. Selected cleaners will also do their job faster as well as rinse off in a more thorough manner.

Here are the most common types of floors used in the modern industrial plant, together with the types of cleaners best suited for cleaning them and the reasons:

1. Cement Floors

Normally, cement floors are not slippery when wet with water, but they are slippery when grease or oil deposits occur. Moreover, neglected oil and grease deposits tend to cause the cement surface to deteriorate.

Cleaning compounds for cement floors should possess the essential qualities of effective wetting action, speedy penetration, ability to emulsify greases and oils, and rapid rinsing. Acid action is always to be avoided on cement surfaces where repeated cleaning operations are involved. Solvents such as gasoline or benzine are not only ineffective, but also so dangerous from the fire and explosion hazard viewpoint, that their use should be a criminal offense.

A properly compounded, moderately alkaline cleaner has a number of advantages. It can and should be compounded so that it possesses a definite hardening action on the floor surface, so that with each washing, added hardness of the surface should be obtained, with consequent improvement in the service life of the floor. At the same time the cleaner can be provided with a whitening action on the cement.

Note, however, that in recommend-

ing an alkaline type of cleaner, we are not stating that alkalies make good floor cleaners. Strong alkalies, used alone, should not be selected for cleaning cement floors, not only because they are dangerous to use and are mighty hard on the shoes and clothing of workers, but also because they have poor rinsing properties. They may clean in most cases fairly well, though they have no hardening or whitening action, but a persistent film of unrinsed alkali is found after rinsing, leading to excessively slippery conditions.

Another point deserving careful attention in this connection is the effect of unrinsed alkaline residues on the break-up of cement surfaces. Where the top or "weathered" area of a cement floor has become cracked or pitted for any reason, these salts can penetrate a considerable distance into the aggregate. As the water of the solution evaporates, they crystallize, exerting considerable pressure in localized areas, thus tending to crack or chip the cement.

The method used in cleaning cement floors will depend mainly on the heaviness of the dirt deposit. Where a good cleaning routine has been consistently followed and the dirt, however extensive, is not the result of long accumulation, the cleaning solution is made up to the proper strength and is mopped on the area to be cleaned—about 100 square feet at a time. It is allowed to soak in for five to ten minutes and is then mopped or lightly brushed, followed by a thorough rinsing with mop or hose, preferably the latter.

Where the deposit has accumulated for a long time and the alkaline type cleaner is to be used for its hardening and whitening effects, the main body of the dirt deposit should first be removed by scraping. Here the strength of the solution should be somewhat greater, and more than one application may be needed to get a well-cleaned surface.

However, accumulated greasy or oil deposits can also be attacked successfully with an entirely different type of cleaner. This material, called an emulsifiable solvent cleaner, is sold in the form of a concentrated fluid, which is mixed with kerosene or safety solvent. The resulting mix is completely safe—being non-flammable and harmless to hands, skin, and any metal or other surfaces.

In use, the concentrate is mixed with solvent and the mixture sprayed, sponged, or mopped on the area to be cleaned. After a five to ten minute soak (longer if the deposit is thick) the area is flushed with a pressure hose, using water at normal tap temperature, since hot water is not necessary. A well-cleaned floor is the result, with a slight residual film of solvent, which soon evaporates and does not cause a slippery condition.

2. Wood Floors

Cleaning wooden floors is a most important problem, because the wrong type of cleaner may lead to irreparable damage.

This type of floor is exceedingly slippery with oil and grease deposits, as well as with many solid dirts. As a matter of fact most wooden floors are slippery when wet with water alone—and present an especial hazard when the water contains soap residues.

Therefore cleaning operations should be based on compounds that do not contain soaps, and rinsing qualities are very important.

The type of cleaner previously recommended for cement floors has been found to be well adapted to industrial wooden floors wherever the dirt is greasy or oily. Rinsing, as has been pointed out, is easy and thorough, so that it is not difficult with this type of cleaner to get a completely clean, film-and-residue-free wooden floor.

There are, of course, many wooden floors that are painted or otherwise finished. For cleaning this type of wooden floor, the alkaline cleaner is not recommended because it will attack the paint or other finish on the floor surface. Instead, the use of the solvent soap type of cleaner discussed under linoleum floors is advised. This cleaner has a soap content, however, and though it has exceptional rinsing properties, a reasonable amount of care should be followed to see that rinsing is complete, to avoid the peculiar slippage hazard of soap residues on wood floors.

3. Linoleum Floors

In extensive industrial use where light manufacturing operations are carried on.

Linoleum is not resistant to alkalies. The presence of water under the linoleum is always to be avoided, since it tends to loosen the bond between the linoleum and the surface below and also leads to rotting.

Alkaline cleaners should be avoided, because even moderately alkaline solutions will attack the linoleum and dull the colors and brilliance of the surface.

The most suitable cleaner for linoleum floors is a neutral soap, with added ingredients for producing wetting and rinsing speed and effective solvent action. This soap does not hydrolize to release alkalinity so its alkaline action is at a minimum. Its solvent action, plus the normal detergent and suspending properties of the soap content, leads to rapid wetting, thorough penetration and effective loosening and/or dissolving of dirt deposits, particularly grease and oil. With this type of cleaner, excessive brushing and scrubbing are eliminated and long extended contact of the cleaning solution with the floor is avoided. It rinses exceptionally well.

It is applied in the form of a concentrated paste or jelly to which water is added to make up the cleaning solution which is usually mopped or brushed on the linoleum, without any soak-in period. Moderate brushing or mopping will remove all but the thickest deposits or stains.

The solvent soap type of cleaner is usually rinsed off linoleum plant floors but this rinsing is not always essential, since the film it leaves is not dulling nor is it particularly slippery. When not rinsed the floor surface takes on added brilliance.

4. Cork Tile Floors

These floors have limitations much like those of linoleum, as far as suitable locations are concerned. They are somewhat more resistant to alkalies, but are sufficiently sensitive to avoid the use of alkaline cleaners. They are particularly vulnerable to water deposits under the surface. The properties that recommend the solvent soap cleaner for linoleum and wood make it also highly satisfactory for cork tile floors. It is used in the same way.

5. Asphalt Plastic Floors

Floors based on asphalt or asphalt emulsions, with varying fillers and aggregates are in considerable use industrially. The so-called "hot mastic" type of floor stands up well under wet conditions and is resistant to acid action. It is, however, adversely affected by oils and greases, and is not adapted to heavy traffic or trucking. "Cold mastic" floors, properly laid, stand up extremely well under heavy trucking and traffic, but they do not resist either water or oils and greases. Compressed asphalt blocks, though similar in composition to "hot

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mastic," tend to be materially more resistant to water, oils, and greases.

On "hot mastic" floors the solvent soap type cleaner is recommended with the same technique of use as for wood and linoleum.

On "cold mastic" floors this same cleaner can be used, in spite of the lower resistance to water, because of its speedy cleaning action and rapid rinsing. However, a still faster type of cleaner for such floors is available, based on a new type of wetting agent. It is similar in action to the emulsifiable solvent type of cleaner but works even faster. Because of its fast wetting action, it is exceedingly easy to rinse off.

This special cleaner is used in water solution, mopped on over small areas, cleaning as it is mopped on. Rinsing is a simple mopping operation.

6. Wood Block Floors

Floors laid with creosoted or otherwise impregnated wood blocks do not take on the characteristics of ordinary wooden floors. Because of impregnation, and the way the wood grain is exposed, such floors are sturdier. They are strongly resistant to water, grease, oil, and acids, and stand up well even under heavy trucking and traffic.

This type of floor is exceedingly slippery when grease and oil deposits occur and is, in fact, fairly slippery when wet with water. Cleaning these floors is best entrusted to the alkaline type of cleaner described under cement floors.

7. Rubber Floors

Particularly sensitive to the action of chemicals. They are in limited use in industry, but are well suited to light traffic and trucking operations where quiet is desirable.

Strongly alkaline cleaners should never be used and even mildly alkaline cleaners can lead to material damage. The cumulative effects of unrinsed cleaner residues, whether alkaline, soap film, or abrasive will be damaging to this type of floor.

The solvent soap cleaner recommended for linoleum and wooden floors is best adapted to rubber floors, but care should be taken to clean only small areas at a time, to avoid too long a contact of the solution with the rubber. In other words, even the limited alkalinity of this cleaner should be used with caution on rubber flooring. An alternative cleaner for rubber floors is the special wetting agent type discussed under asphalt plastic floors.

8. Brick Floors

Vitrified brick floors have many advantages, particularly in plants where acid conditions prevail. They are, in fact, exceptionally resistant to chemical action generally and, in addition, to abrasion. They stand up well under fairly heavy trucking, but are, of course, susceptible to impact damage. These floors are more slippery than most at spots where dirt, particularly that which contains grease or oils, has been allowed to accumulate. Particular care should be taken to maintain a strict cleaning routine on such floors.

Because of their resistance to chemical action, brick floors can stand the stronger action of the alkaline cleaners recommended for cement. The technique of use is the same.

9. Tile Floors

Tile floors are similar to brick floors in their resistance to chemical action and abrasion. On the whole, however, they are not suitable in manufacturing operations where heavy trucking is involved and will not stand up long under impact loads.

Tile floors are also exceptionally slippery when dirty or wet, and a strict cleaning routine is essential for safety.

Thorough rinsing is an essential quality in any cleaner to be used on tile floors, in order to remove all traces of dirt and cleaner, and to insure speedy, thorough drying, since, as has been noted, a tile floor is slippery when wet.

The solvent type cleaner with pine oil added is well adapted to this type of floor, because of its speedy cleaning action and excellent rinsing properties. The deodorizing and disinfecting properties of this cleaner are particularly desirable in toilets, showers, and washrooms of industrial plants, where tile flooring is in extensive use. The alkaline cement cleaner also can be used.

10. Terrazzo Floors

Not in very extensive industrial use, but of sufficient importance to warrant specific mention.

Though this type of floor is made up of marble chips embedded in cement, it is not generally understood that its predominant characteristics are those of marble rather than cement.

It is not quite as slippery when wet as marble, but there is little to choose between the two when dirt deposits are greasy or oily. It is low in resistance to acids of any kind, and though it stands up fairly well under abrasion, it tends to disintegrate under trucking or impact.

Alkaline cleaners should not be used on these floors, because the penetration of alkaline salts in the cleaner into both the interstices between the marble chips and the cement and into the porosities of the marble itself makes it almost impossible to rinse them out after cleaning.

Terrazzo floors should be cleaned with a neutral solvent cleaner of the type already described, with rapid penetrating and wetting properties and thorough rinsing qualities.

11. Marble Floors

Marble floors are practically nonexistent in the industrial field, but because certain floors in plant office buildings may be of this type, data are included here.

Marble is a rather porous stone into which dirt tends to penetrate deeply. Where such floors have been allowed to accumulate dirt for long periods, a special cleaner is required, involving not only the use of a thick poultice of cleaner paste which must stay on the floor for some time, but considerable heavy scrubbing.

For a new marble floor or where a consistent cleaning routine has been followed, the solvent type cleaner described previously is capable of keeping marble floors in excellent condition without danger of damage.

Floor cleaning in the industrial plant deserves the kind of attention that is involved in the careful selection of cleaning materials. It is not in any sense a haphazard operation to be entrusted to casual or careless clean-up crews, but should be studied and worked out just as efficiently and economically as any plant production problem.

If all that a carefully planned and followed floor cleaning routine could do would result in materially improved under-foot safety, with consequent elimination of slippage, skidding, and wrenches, it would be worth every bit of effort involved. But clean surroundings, particularly clean floors, are powerful aids for maintaining high morale, alertness, and efficiency.

Finally, care used in selecting and using the proper floor cleaner will be repaid in another way—greatly increased service life of plant floors.

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QUIET

MAINTENANCE SHORTS

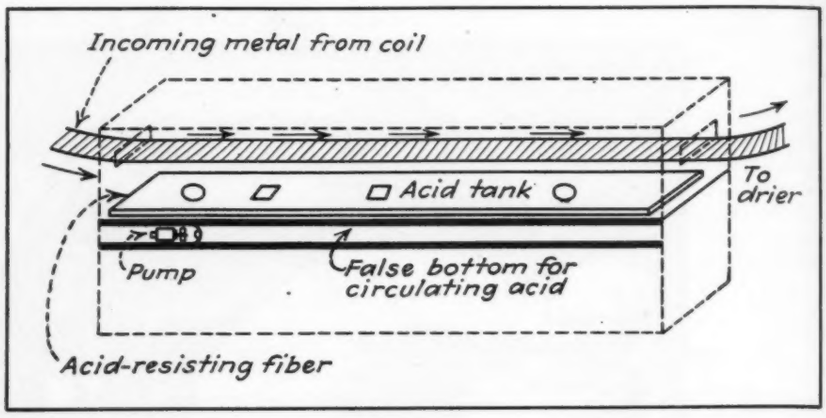
Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

Capacitors Save 4 Percent of Plant Power Bill

SOURCE—Westinghouse Electric and Manufacturing Company, East Pittsburgh

Application of capacitors on two feeders at the plant of the Diamond Match Company, Chico, Calif., increased the power factor from 55 percent to 72 percent and resulted in a saving of $75 a month, or about 4 percent of the power bill. Total rating of the capacitors now used is 180 kva. Installation of an additional 360 kva. in corrective capacity is contemplated. It would raise the power factor to about 95 percent, with an estimated savings of $120 a month more.

A match factory and a lumber mill are operated on the same premises. Three-phase power is brought in at 60,000 volts and fed to each plant through an individual transformer that provides 460 volts for driving woodworking and match-making machines. A bank of three-phase capacitors is connected on the low-voltage side of each transformer to correct the power factor on the entire feeder circuit, the corrective capacity being split equally between the two plants.



Fiber Solves Pickling Tank Problem

DANIEL BERG, Bridgeport, Conn.

Our problem is to clean coils of nonferrous metal by running them through a sulphuric acid solution. The metal starts from a coil and, after it has been cleaned and dried, it is coiled again.

The pickling tank we use for this operation was designed with the intention that the metal should not touch the bottom of the tank, but would always remain in suspension. In practice, however, the metal at times touches the bottom. Since this contact scratches the metal, a serious condition with us, something had to be done quickly.

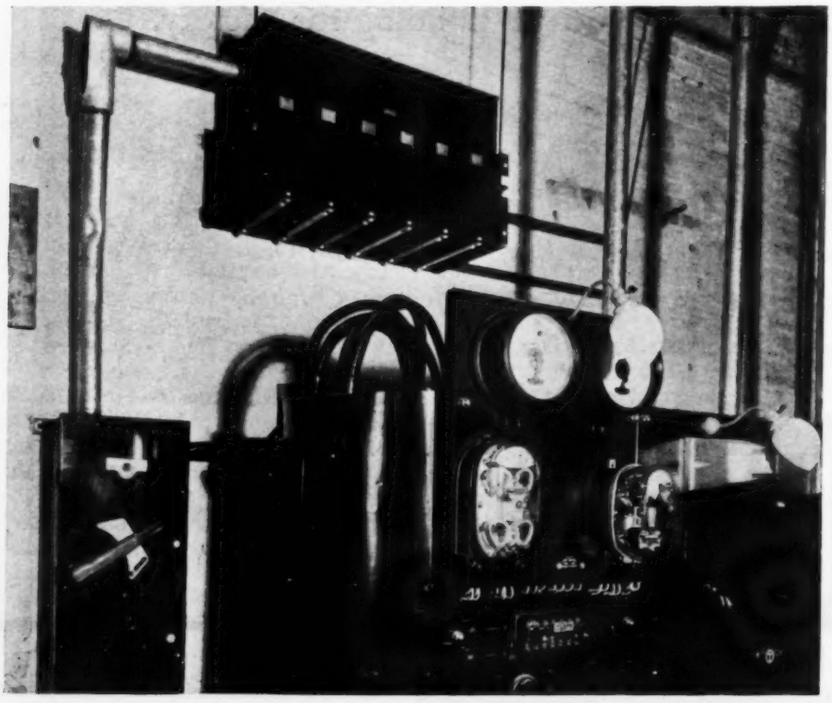
Our first move was to put a wooden board in the bottom of the acid tank, with holes cut in the board through which the acid could circulate when pumped up from the bottom. But the acid quickly ate the sap out of the wood, forming a sludge on top of the acid. If the acid level was low, so that the metal came in contact with this sludge, the metal became badly stained and had to be scrapped. At best, the wooden boards would last about a week.

We were then advised to put glass in the bottom because it would last longer. Against our better judgment we put in a glass that was reinforced with chicken wire. It seemed to us that the acid would attack the wire where it was exposed by being cut to size, and also where the openings had to be cut out. This glass only lasted a day, so we went back to the wooden boards without determining the cause for the prompt failure.

We next tried out a glass that was exceptionally strong and tough, and which would also take considerable bend without breaking. Although it was not affected by the acid, a sharp shock would disintegrate it, and the longest service we got out of this was about two months.

This continual replacement of first the wood, and then the different kinds of glass, was a big expense. It was not only the cost of the material, but there was also considerable work that had to be done in cutting the holes, sizing and fitting, and also the time of two mechanics in making the repair and replacement. Then also, our production was stopped.

We found success at last when we in-



This group of capacitors, one of two 90-kva. banks, is mounted out of the way above the power metering panel in the match factory

Accidents lurk when power and speed crowd *PIPING TURNS* too!

In 6-day bicycle races, if riders come to grief—it's usually on the turns where speed and strain increase the danger. (I.N.S. photo)

Weld piping with TUBE-TURN fittings to prevent trouble at the crucial spots!

It takes strength and stamina to withstand the grueling pressure of a 6-day bike race, but that's nothing to the strain and stress imposed on many piping lines. The greatest concentration of pressure in pipe lines is placed on the turns—*wherever there is a change of flow direction.* Tube-Turn fittings are engineered for added protection *where the danger lies*—wherever elbows, returns, tees, reducers, laterals, nipples and flanges are used. You will find a type, size and weight of Tube-Turn fitting for *every* pipe welding need. Look for the Tube-Turn insignia welded on each fitting.

Write for Tube-Turn engineering data book and catalog.

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TRADE-MARK

HOW TUBE-TURN FITTINGS PROTECT WHERE FLOW DIRECTIONS CHANGE

This compact piping installation illustrates four common points that occasion *changes in flow direction*—a welding tee at the top, then a 90° elbow, a reducing outlet welding tee at the right, and a concentric reducer near the bottom. Tube-Turn welding fittings are used here to guard against danger at these turns.

stalled a sheet of acid-resisting fiber. After our continual irritation and expense, we were skeptical, but the material has been in the bottom of our acid tank for more than a year, and so far as we can see, it looks good for many years to come.

•

Drum Reeving Simplified

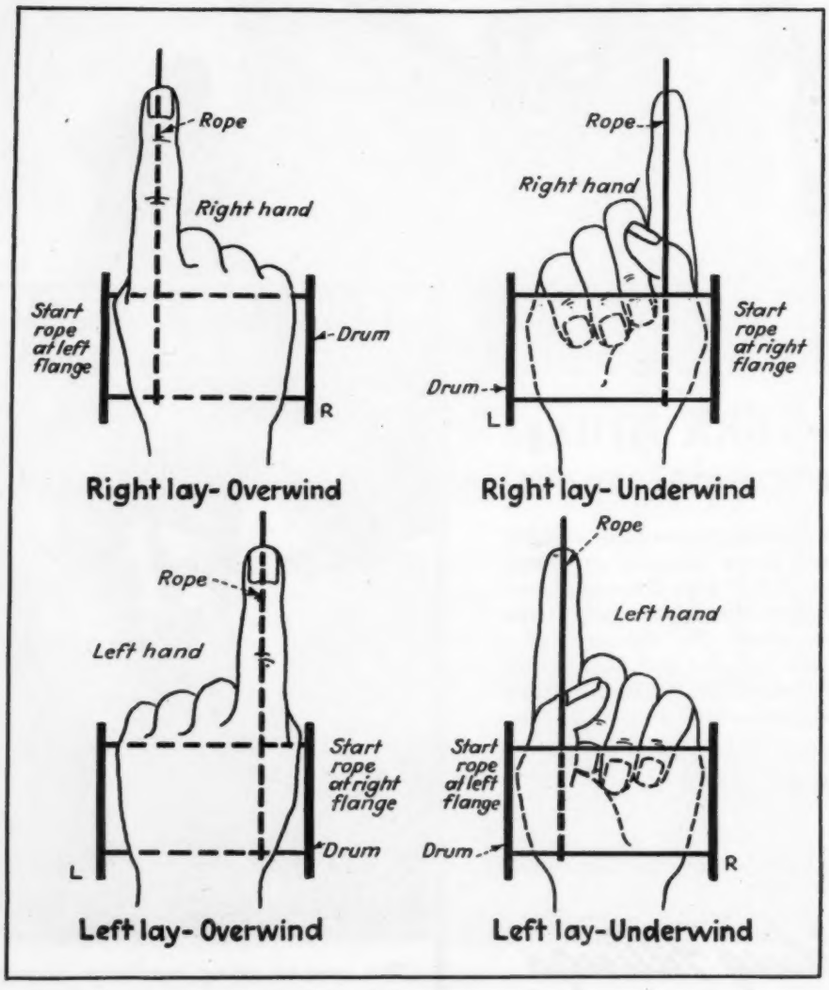
SOURCE—American Chain & Cable Company, Chicago

There is a rule, a rather complicated one, that tells at which drum flange to start roping a smooth drum. If started at the proper flange the rope will wind with the wraps tightly hugging each other. It will so wind itself on the drum that there will be no space between wraps into which a wrap from the layer above might squeeze and cause serious scrubbing, scarfing or binding. If a rope is not to damage itself prematurely the wraps must lie as close together as possible.

To reduce the tendency for rope to spool unevenly, many users are employing the preformed type, since in the manufacture of this type of rope practically all internal torsional stresses are eliminated. One result of "preforming" is to make the rope resist rotating when passing over drums and sheaves as is common with non-preformed. This resistance to rotating, whipping, together with its freedom from "crankiness" permits preformed rope to spool much better. However, regardless of the type of rope used, *all* ropes should be properly started on the drum. Here's the rule:

When a right-lay rope is being underwound on the drum (which is to say, it leads from the bottom of the drum) start it from the right flange, looking at the drum from the rear. If a left lay rope, start it from the left flange. Conversely, if a right lay rope is being overwound (that is, it leads from the top of the drum) start it from the left flange. If a left lay rope (overwound) start it from the right flange.

That's a complicated rule to remember, and more frequently than not quick reference to it is not available at the machine. So—here's a far simpler rule—using your doubled-up fist to represent the drum, and the index finger to indicate the flange. With right lay rope use the right fist. With left lay rope use the left fist. For overwound rope keep your fist back up. For underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange. The accompanying illustrations show how easily this rule may be applied.



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To reduce the chances of slipping on working platforms wet with cutting lubricant, one company redesigned the metal platforms furnished for a battery of large boring mills by cutting them down and applying wood-block as the surfacing material.

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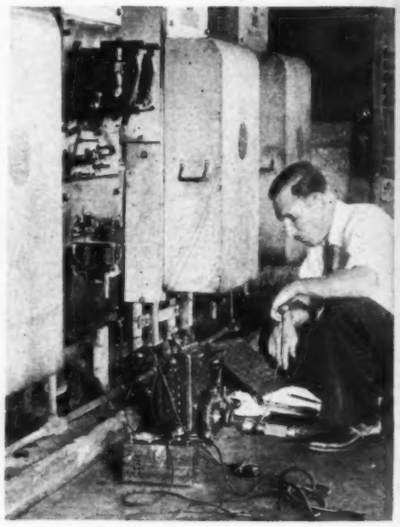

Overload Relays Need More Than Inspection

GILBERT LINDGREN, Electrical Foreman, Hudson Valley Fuel Corp., Troy, N. Y.

Routine inspection serves its purpose well enough for most pieces of equipment, including controls, but it should not always be depended on in the case of overload relays. The safest and surest way to check these important elements is by the use of a phantom load that can be controlled and measured.

If a time-delay element is used with the relays it is necessary to have an accurate timing device to check the exact time required for the relay to operate. The illustration shows the set-up, comprising load box, ammeter, and timing device which we use in checking overload relays, in this case those which protect a 150-hp. motor-driven pump.

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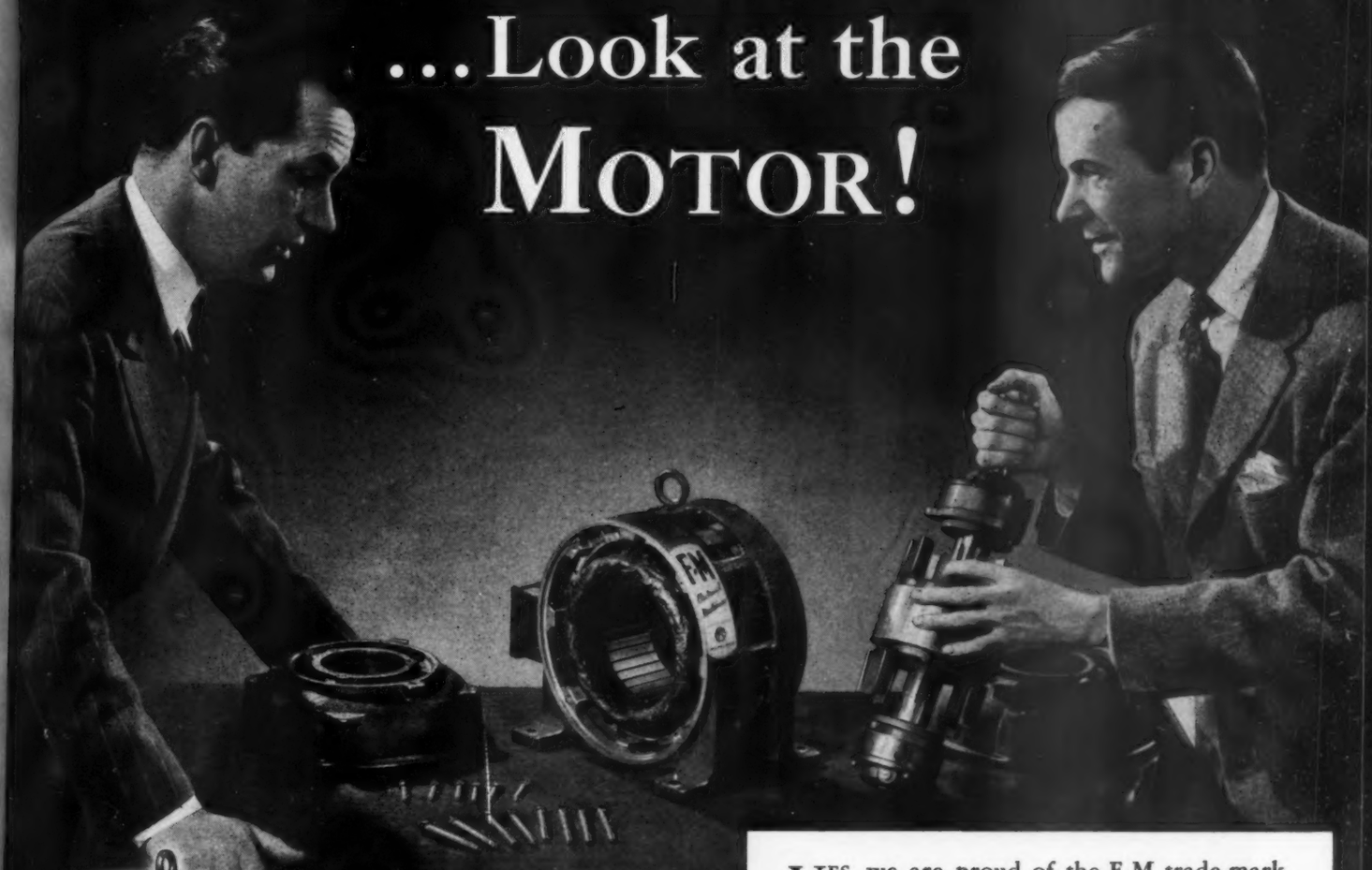

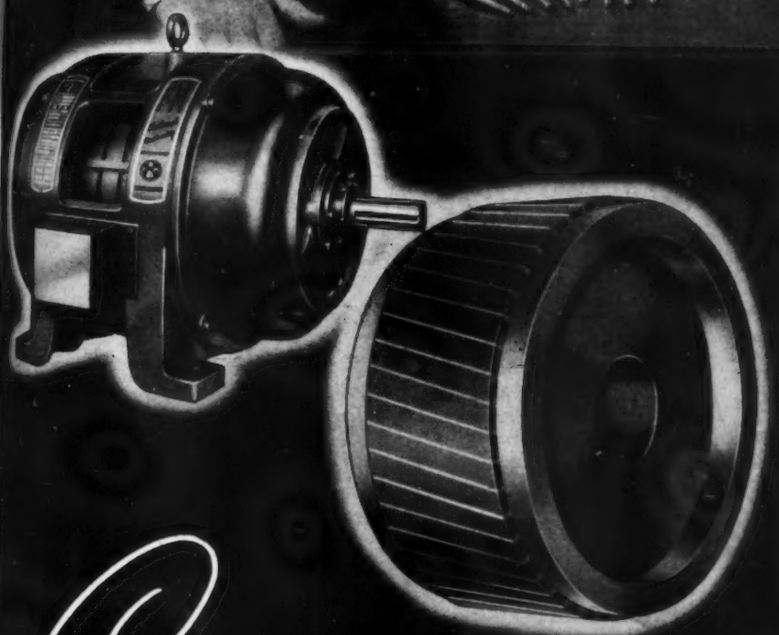

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How to Inspect Drums and Sheaves Used With Wire Rope

A. J. MORGAN, Chief Engineer, Wire Rope & Strand Division, John A. Roebling's Sons Company, Trenton, N. J.

PROPER INSPECTION of wire rope must necessarily include examination of the equipment on which it is being used. In the majority of instances the cause of abnormal deterioration of wire rope is to be found in the machinery on which it is operating.

The principal items to be checked are:

1. Sheaves
2. Drums
3. Reeving
4. General operating conditions

Sheaves

Points to be checked on sheaves are:

1. *Size.* Measure the diameter of a sheave from bearing surface to bearing surface, not from flange edge to flange edge, because it is the radius of the bearing surface that governs the degree of bending to which the rope is subjected as it travels over the sheave. Table I gives the recommended and the minimum sheave diameters for various constructions of rope.

These recommendations apply to drums as well as sheaves. Since the rate of fatigue of wire rope is governed very largely by the radii of the bends which it must take in normal operation, it is extremely important that the recommended diameters be equaled or exceeded. A large amount of internal wear is caused by improper sheave and drum diameters, since the radial pressure on a wire rope increases in inverse proportion to the radius of the bend. As the radial pressure increases a crushing action takes place in the rope, which increases internal friction and causes nicking of one inside wire by another.

2. *Sheave Grooves.* The diameter of the bearing grooves of sheaves and drums must bear a certain definite relation to the diameter of the wire rope used in it. See Figure 1. As a rope passes constantly over the sheave, the groove is worn deeper and its diameter becomes constantly smaller until it is less than that of a new rope of listed diameter. When a new rope is placed in such a groove it will be forced down into the groove and be pinched out of shape. Hence, it will be subjected to extreme conditions of abrasion against the sides of the groove. Also, it will be forced out-of-

(Continued on page 116)

Table I. Recommended and Minimum Diameters for Sheaves

Rope	Recommended Diameter No. Times Rope Diameter	Minimum Diameter No. Times Rope Diameter
6 x 7	72	42
6 x 19	45	30
6 x 30 (Stype G)	45	30
6 x 37	27	18
8 x 19	31	21
18 x 7	51	34

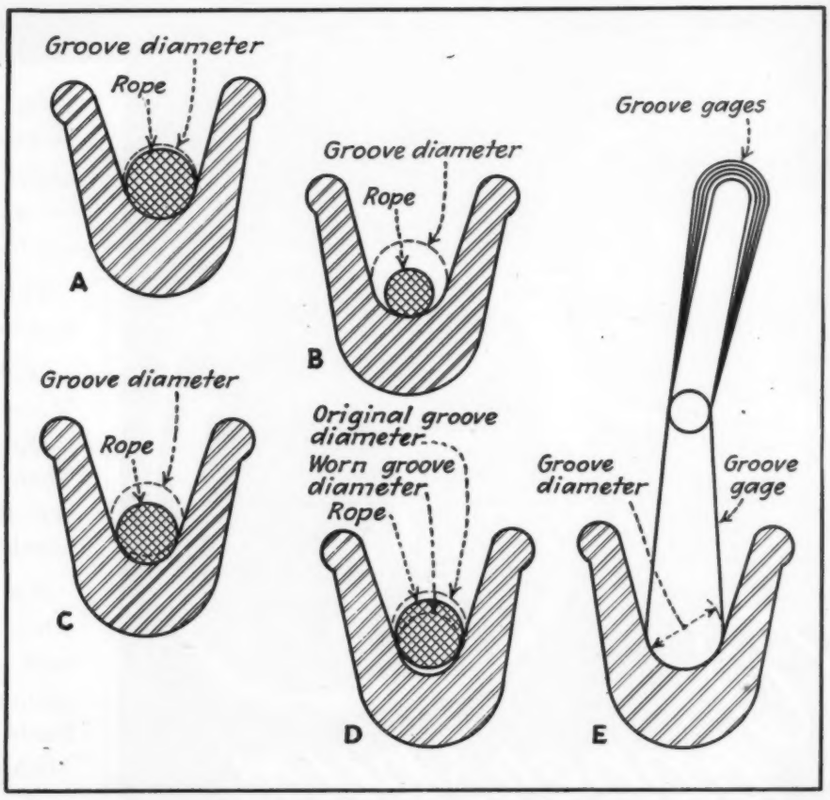

Figure 1. Grooves should support a wire rope for nearly one-half its circumference, as in *A*. When a groove is too large, *B*, the rope tends to flatten under tension. *C*, this groove has worn to the decreased diameter of the rope. *D*, a new rope in a worn groove will be inadequately supported. Use a groove gage, *E*, to check grooves

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—and illness costs YOUR BUSINESS a full week's production every year!

A report of the U. S. Public Health Service indicates that workers average one week's absence each year for illness. Over *half* of this lost time can be traced to colds and their complications, other studies show.

Absences were reduced 29.7% in companies which started health programs, according to a recent survey by the National Association of Manufacturers. Soap, hot water and individual tissue towels do much to prevent the spread of communicable illness.

Half again as many workers as last year are now given the protection of "Soft-Tuff" ScotTissue Towels. When wet, these towels have *10 times more rub strength* than former ScotTissue Towels. Yet they are soft as ever. Since one towel does a complete drying job, important economies result.

• Skilled help in improving washroom hygiene, comfort and efficiency is available from the Scott *Washroom Advisory Service.*

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INDIVIDUAL...SANITARY
STAY TOUGH WHEN WET

Soft-Tuff ScotTissue TOWELS

How to Inspect Drums and Sheaves Used With Wire Rope (Continued from p. 114)

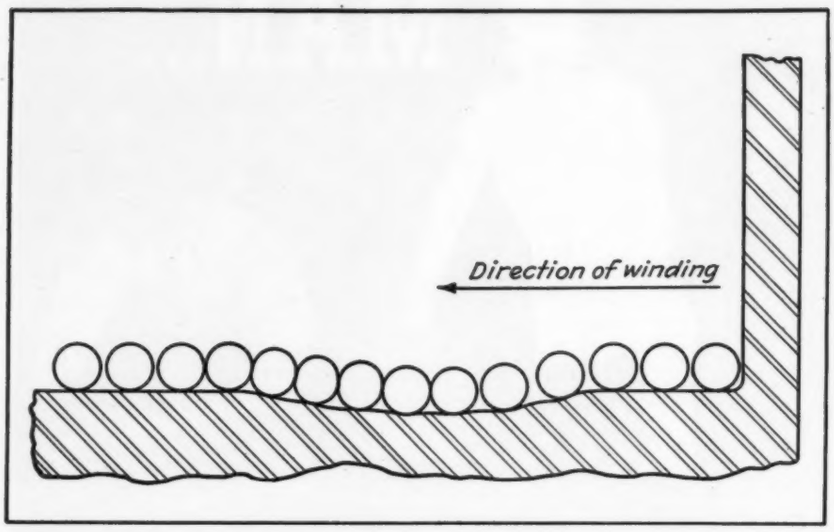

Figure 2. When the surface of a smooth drum becomes uneven, the rope layers are wound too loosely in some places, while they rub heavily in others causing unnecessary wear

round and therefore will become unbalanced.

On the other hand, a rope placed in a sheave groove of too great diameter will not be afforded proper support. Such a condition tends to allow the rope to flatten out as radial pressure is applied to it.

The ideal condition is that in which the wire rope receives support from the sheave groove around just less than one-half of its circumference. The rope is thus allowed freedom of action with a maximum of support. Gages for measuring sheave grooves can be obtained from any wire rope manufacturer.

Table II gives the tolerances recommended for sheave grooves.

3. *Sheave Materials.* Sheaves of too-soft material will be cut by wire rope, and their bearing surfaces will become corrugated to fit the contour of the rope used over them. This contour will not exactly conform to that of the next rope to be used over them; therefore the new rope will be cut and worn by the corrugations. Where such a condition prevails the sheaves should be re-machined or, preferably, replaced with sheaves of harder material.

Such corrugation will occur more readily if the sheave diameter is too small.

4. *Sheave Operation.* Defective bearings will cause sheaves to wobble or to revolve eccentrically and will thus set up a whipping action in the wire rope. Whipping will, of course, greatly increase the rate of fatigue and other deterioration of the rope. Such a condition should be corrected immediately.

5. *General Sheave Conditions.* A sheave that is out-of-round or has a flat spot on its bearing surface will also cause whipping of the rope and must be repaired immediately. Sheave grooves should be either machined or ground to a smooth and true surface and contour.

When a sheave flange is broken off the wire rope may jump this flange and cause serious damage both to the rope itself and to the machinery. If the rope does not jump the flange, it is at least likely to come in contact with the sharp edges of the broken flange, which may gouge it badly. Such sheaves should be replaced without delay.

Drums

Since a large majority of drums used in industrial service are cylindrical, only that type will be considered here. Recommendations for drum diameters are the same as those for sheave diameters, given in Table I. With grooved drums the recommendations for groove diameters are the same as those given in Table II for sheave groove diameters. Three checks are to be made on drums:

1. *Contour.* With plain-faced drums corrugations on the face will cause the same damage to the rope as discussed under Sheave Materials.

(Continued on page 118)

Table II. Tolerance by Which Groove Diameter Should Exceed Rope Diameter

Nominal Rope Diameter, Inches	*Recommended Tolerance, Inches*
1/4–5/16	1/64
3/8–3/4	1/32
1 3/16–1 1/8	3/64
1 3/16–1 1/2	1/16
1 9/16–2 1/4	3/32
2 5/16 and larger	1/8

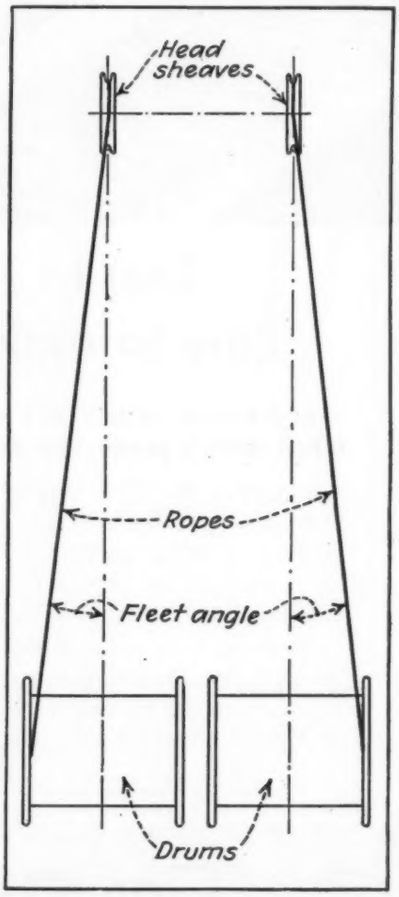

Figure 3. Fleet angle should be not more than 1.5 degrees, not less than 0.5 degrees

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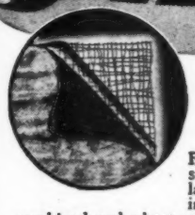

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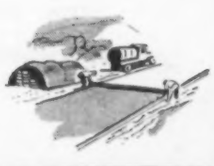


SERVING INDUSTRY . . . . . CONSTRUCTION AND AGRICULTURE THROUGHOUT THE WORLD

How to Inspect Drums and Sheaves Used With Wire Rope (Continued from p. 116)

Drums that have become corrugated should be re-machined. Where the drum shell is too thin it may be lagged with steel plate.

2. *Symmetry.* If the drum face is low at one spot the rope will tend to pile up at this point. The rope coming onto this part of the drum first will wind in too open a wrap, whereas that on the other side of the low spot will wind too tightly, thus causing undue scrubbing of adjacent wraps. Figure 2 shows this condition in somewhat exaggerated form.

3. *Winding.* Where grooved drums properly designed for the rope to be used upon them are employed, no winding difficulties are usually encountered when the fleet angles are satisfactory. Where plain-faced drums are used, however, care must be taken to see that the wire rope winds onto the drum evenly in a continuous loosely closed helix so that one wrap just touches the adjacent wraps. Too-tight winding of rope will cause one wrap to scrub unduly against adjacent wraps, and thereby cause excessive abuse. With multiple-layer drums too-open winding will allow the upper layers to pull down between wraps of the bottom layers, thus causing scrubbing, pinching, and other excessive abuse of the rope.

4. *Fleet Angle.* This is the angle between the center line of the lead sheave and the rope. See Figure 3 The lead sheave is the first sheave over which the rope passes as it winds off the drum.

The fleet angle must be kept within certain limits. If it exceeds 1.5 degrees the rope may wind unevenly, creating scrubbing in spots, and winding loosely in others. Too large a fleet angle will cause the rope to scrape against the flanges of the lead sheave, adding another source of abrasive wear.

If the fleet angle is less than 0.5 degrees, the rope may tend to pile up at the flanges and to wind unevenly after more than one layer of rope is wound on the drum.

Rollers

In some installations rollers or other devices are used to guide the rope or to protect it from scraping against some part of the machinery with which it is not supposed to come into contact. Such rollers should never be less than eight times the diameter of the rope and must be kept in condition to rotate freely. Any rollers with corrugated or imperfect surfaces should be immediately replaced.

Reeving

In reeving wire rope it is important that the rope be subjected to a minimum number of reverse bends, since fatigue will occur much more rapidly as the number of such bends increases. Reeving should in all instances be as straight and simple as possible. Frequently a new system of reeving can be worked out that will yield a considerably longer period of rope service. (See Figure 4).

In studying the reeving of rope, note carefully whether the rope is allowed to scrub improperly against any part of the machinery or other structure during the course of normal operation.

Operating Conditions

Proper operation of the rope-using equipment has a very distinct bearing upon the length of life of a wire rope, although it is not subject to precise measurement. For example, sudden starts produce incalculable strains that can do great damage to a rope. Jerky operation will have the same effect.

If the rope is slack, quick starts introduce serious vibration and impact stresses that result in excessive fatigue and frequently produce failure of the rope.

With cranes, a common source of rope abuse occurs when the load is pulled sidewise, resulting in scrubbing and grinding of the rope against the sheave flanges and often against structural parts of the equipment.

A competent operator can add many working hours to the life of wire rope, just as a competent driver can add many miles to the life of a car.

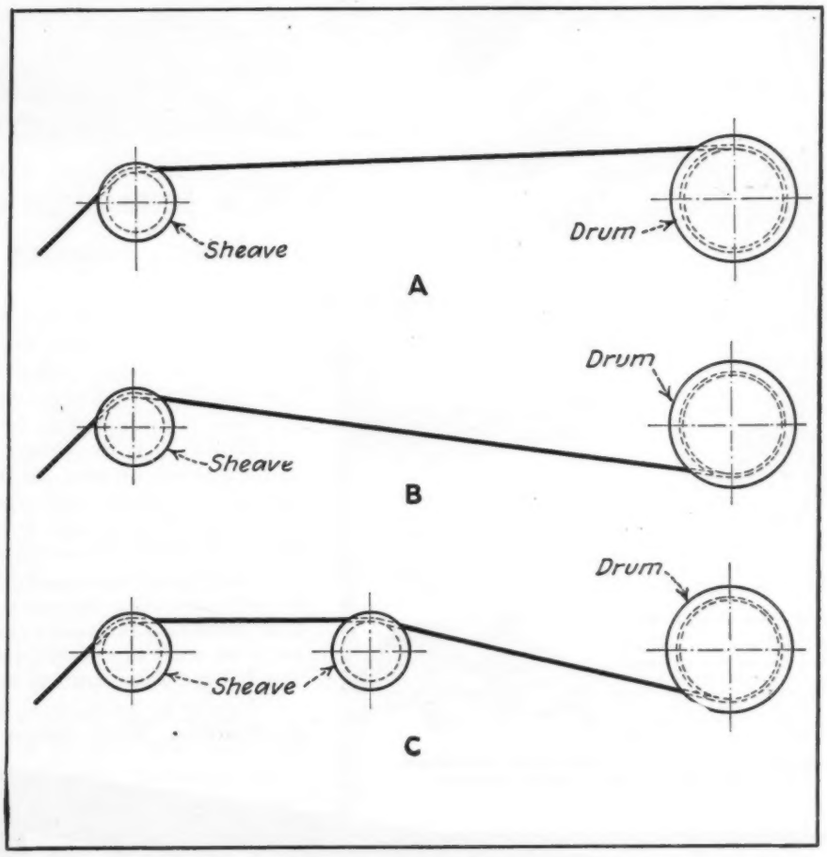
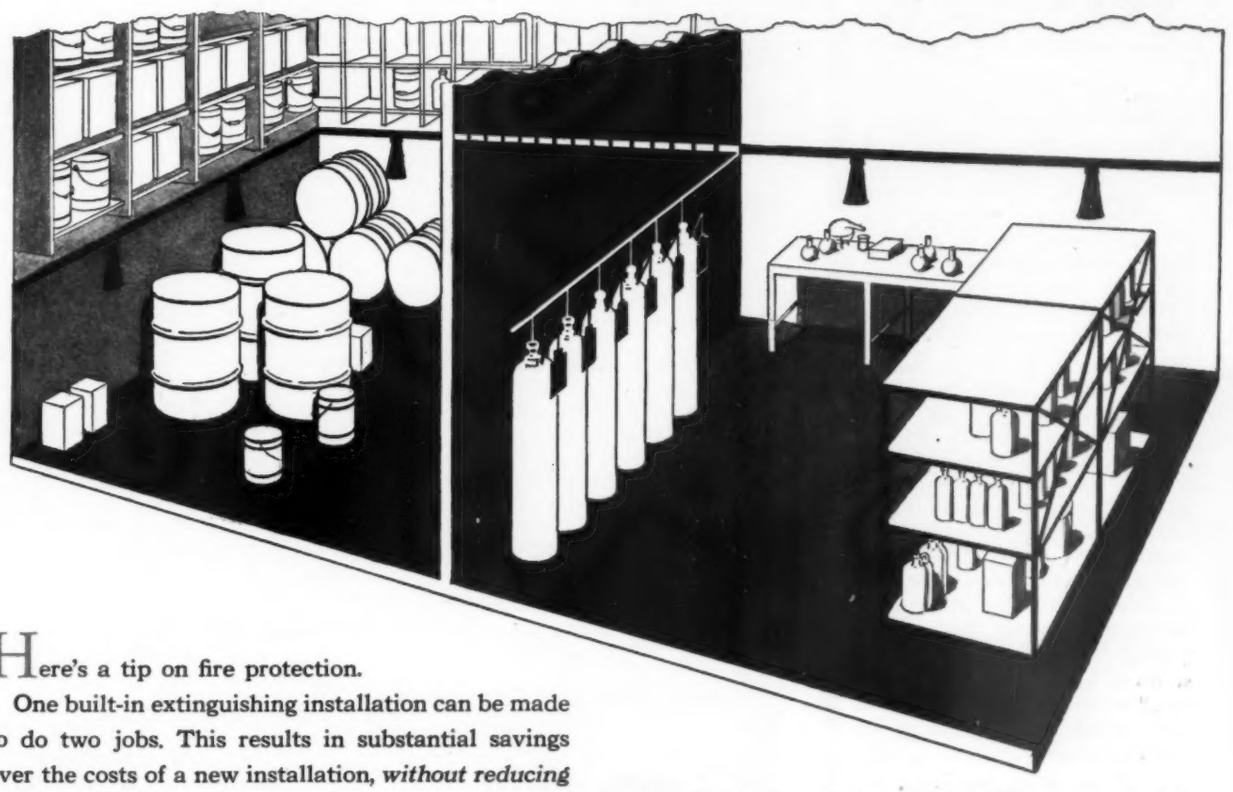


Figure 4. Rope should lead straight and with a minimum number of changes in direction, as *A* and *B* show. Avoid unnecessary changes in direction, *C*, whenever possible

FIRE PROTECTION CAN DO 2 JOBS AT ONCE!



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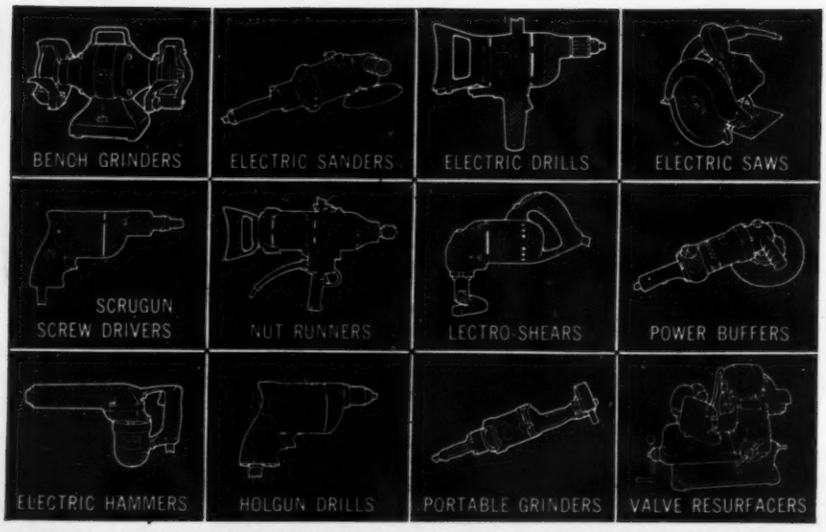

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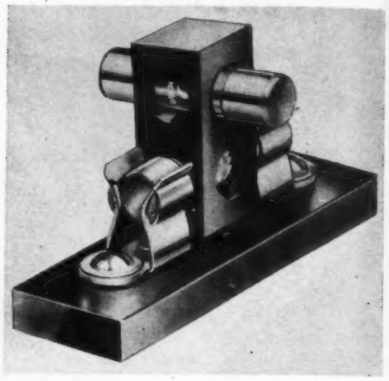

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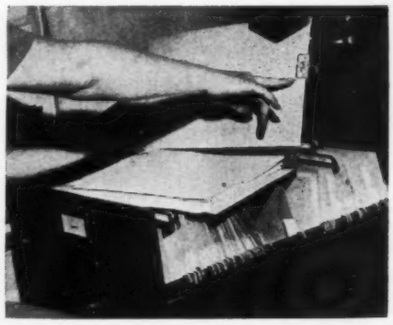

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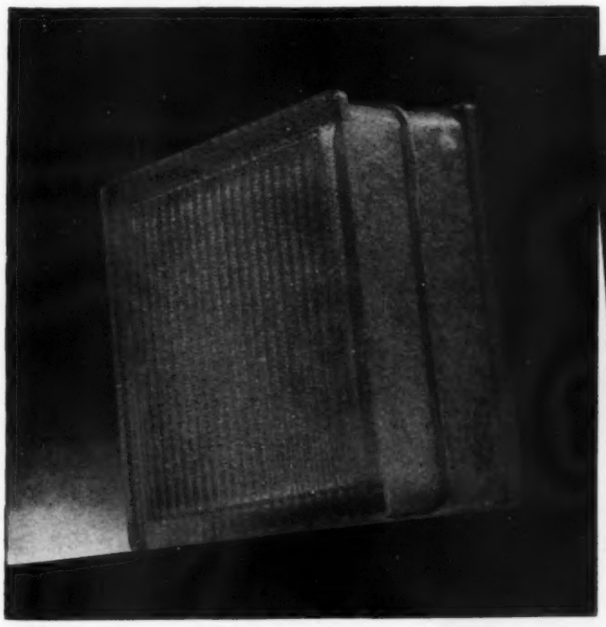

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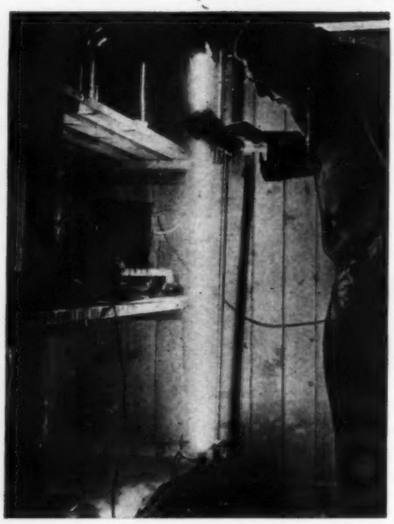

is 55 inches, or more than 4½ feet long, and slightly more than one inch in diameter. It provides 40 lumens of light per watt. It is anticipated that the lamp will make it easier to supply 50 foot-candles of light. For use in factories where high bay lighting is required, high levels of illumination are needed, and color matching is not an important consideration. Westinghouse Elec. & Mfg. Co., East Pittsburgh.

Grinder with Dust Collector

A compact unit, for tool and light snagging grinding, with self-contained dust collector, has recently been introduced. Known as the Hammond OK-10, 12, and 14 grinders, these machines feature a self-contained dust collector, which is mounted inside the base of the grinder. The only parts outside are the fan motor, connecting pipes from wheel guards to dust collector, and air exhaust vent-guard.

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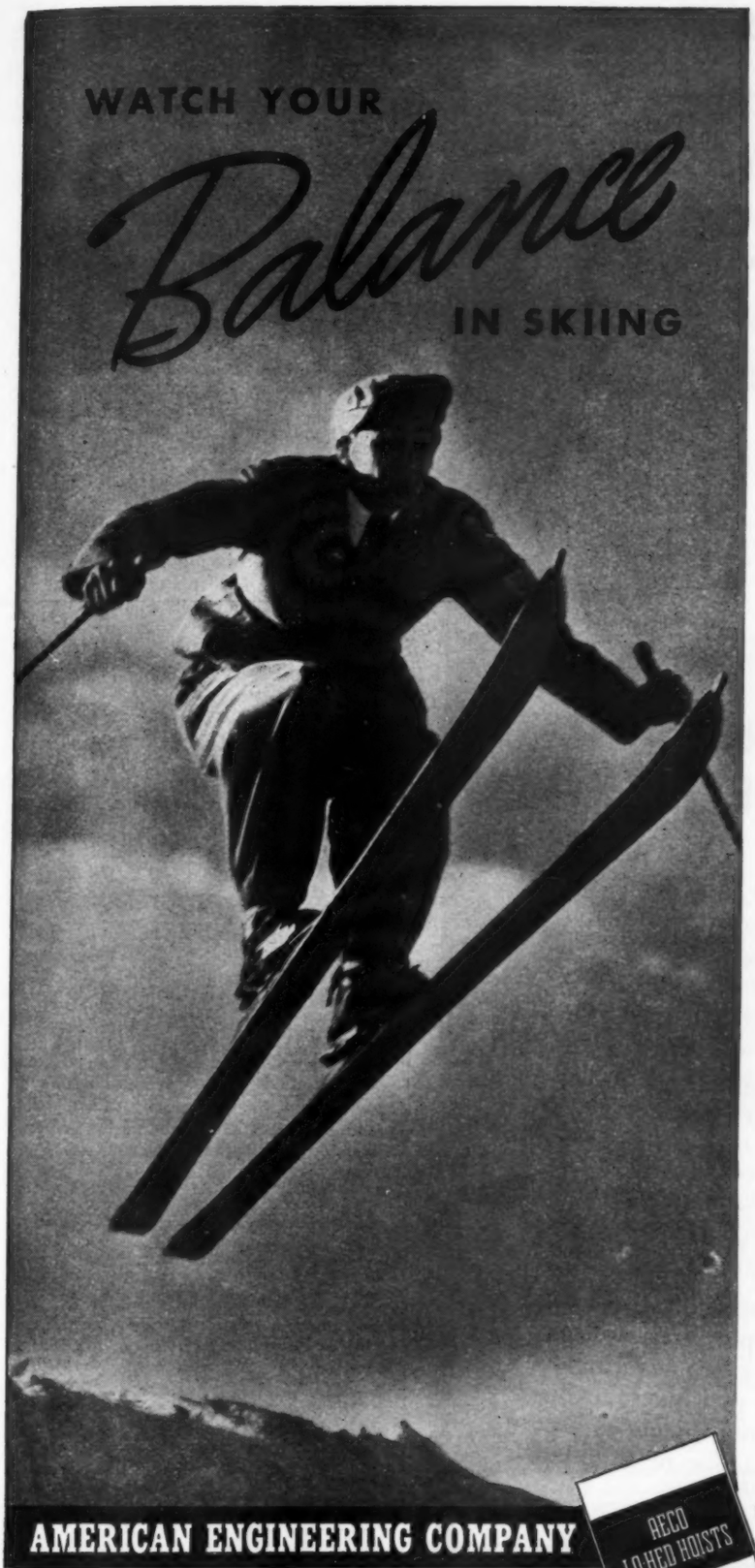

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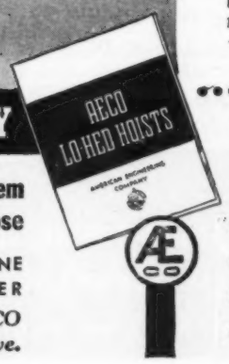

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2426 Aramingo Avenue, Philadelphia

☐ Please send me your complete catalog of LO-HED HOISTS.
☐ Ask your representative to get in touch with me promptly.

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Company_____

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City_____ State_____
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ON THE COUNTRY'S ACTIVE SERVICE

HONOR ROLL

HANSEN Push-Tite
AIR HOSE COUPLINGS

SPEED, EFFICIENCY and ECONOMY is the order of the day in all industrial and aviation plants handling Army, Navy and Aviation jobs. Hansen Push-Tite air hose couplings have been called for active duty in hundreds of these plants because they are the most dependable, efficient and easiest to operate air hose coupling on the market. To connect a Hansen Push-Tite air hose coupling merely give the plug a slight push into socket, it is connected and the air is automatically turned on. An easy pull back on sleeve and it is disconnected instantly and air is automatically shut off.

Hansen Push-Tite air hose couplings are absolutely air tight at all pressures, no leakage at any time. There is no twisting or turning of parts in order to connect or disconnect and no kinking or twisting of hose due to complete swivel action of coupling.

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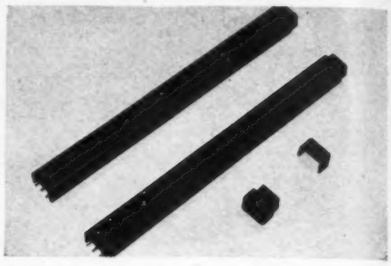
Hansen MANUFACTURING CO.
1786 E. 27th STREET • CLEVELAND, OHIO
Manufacturers of Industrial Air Line Equipment

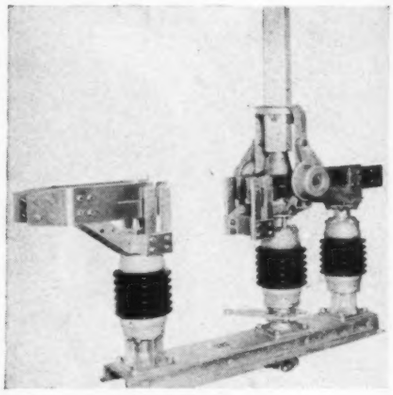
parts—feed and outlet sections, male and female end caps. Series 200—medium-duty size, is rated at 35 amps. for continu-



ous operation; Series 300—heavy duty size, is rated at 45 amps. for continuous operation. They are not interchangeable. Pierce Laboratories, Inc., Summit, N. J.

Switch

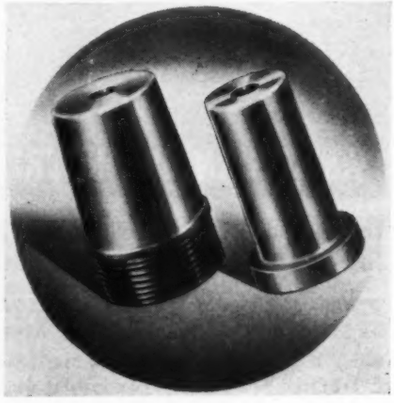
Single-pole unit of a three-pole switch has a square copper tube blade which, by a 45-deg. bearing mounted on top of the center rotating insulator unit, is raised or lowered. The same movement also turns



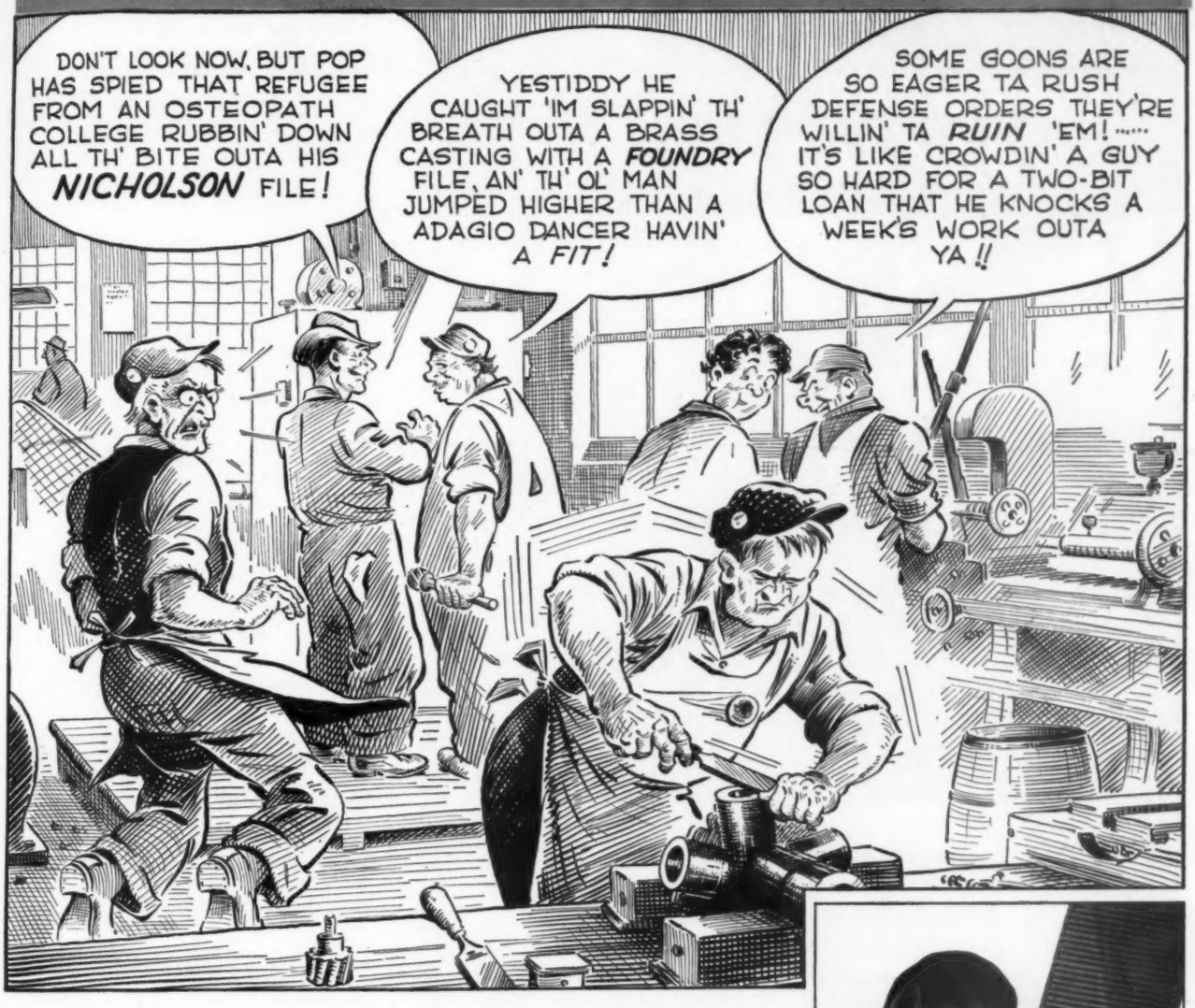
the blade corners into high pressure connection with fixed contacts at both blade ends. Coiled springs inclosed in circular housings at the hinged end of the blade counterbalance it and the switch is easily operated. Delta-Star Electric Co., 2400 Fulton St., Chicago.

Abrasive Blast Nozzle

A hard, abrasion-resisting ceramic now being used instead of metal for the inserts of "Long-Lyfe" nozzles, is said to effect substantial saving in operating costs. The cost of compressed air is kept at a mini-



"HASTE MAKES WASTE" AS POP SEES IT


DON'T LOOK NOW, BUT POP HAS SPIED THAT REFUGEE FROM AN OSTEOPATH COLLEGE RUBBIN' DOWN ALL TH' BITE OUTA HIS NICHOLSON FILE!
YESTIDDY HE CAUGHT 'IM SLAPPIN' TH' BREATH OUTA A BRASS CASTING WITH A FOUNDRY FILE, AN' TH' OL' MAN JUMPED HIGHER THAN A ADAGIO DANCER HAVIN' A FIT!
SOME GOONS ARE SO EAGER TA RUSH DEFENSE ORDERS THEY'RE WILLIN' TA RUIN 'EM!..... IT'S LIKE CROWDIN' A GUY SO HARD FOR A TWO-BIT LOAN THAT HE KNOCKS A WEEK'S WORK OUTA YA!!

LET'S GO! U.S.A. KEEP 'EM FLYING!

UNDER the stress of defense demands, "faster production" is heard with endless insistence in nearly every plant or shop. But speed which results in a high percentage of rejects isn't speed at all.

That is why *the right tool* is as important as *the right man* for the job. And preventing abuse or needlessly rapid wear-out of tools is another factor in the mind of the efficient foreman or production superintendent.

Files. The current demand is prodigious. Nevertheless, Nicholson is deeply interested in enabling users to get the most out of them—both in wear and in product output.

Nicholson and Black Diamond special-purpose files, for instance, have distinctive features for fast and efficient work on certain types of metals and filing jobs. Naturally, they must be used properly for best results. Toward this end, Nicholson has prepared a series of

TECHNICAL BULLETINS on the characteristics and handling of Nicholson and Black Diamond Files for Stainless Steel, Aluminum, Brass, Lead, Foundry Castings, Die Castings, Plastics; Shear Tooth and Lathe filing.

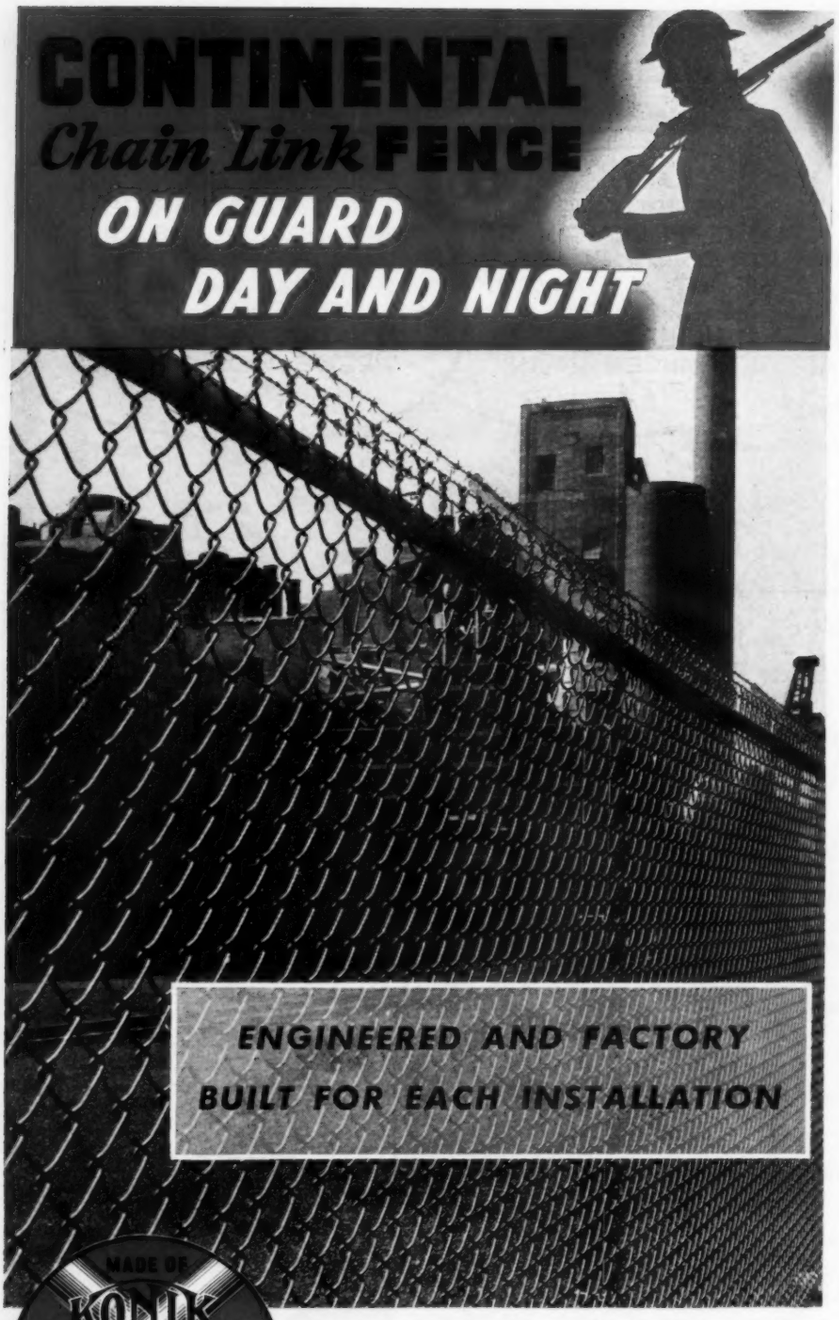
• **WRITE US** *for any of these Bulletins (whether you use our files or not). And for your file needs, consult your mill-supply house.*

NICHOLSON FILE CO., Providence, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

BRASS FILE. In addition to short upcut angle, has VERY FINE and long-angle overcut—producing small scallops which break up filings and enable file to clear itself of chips. Excellent for both fast metal removal and smooth finishing—according to pressure applied.

NICHOLSON FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U.S.A.



FREE FENCE MANUAL

Send for "Modern Property Protection"—this manual has 100 charts, drawings, photographs. Gives complete data for fencing property.

Plant protection is an immediate necessity. Continental Chain Link fence will solve this problem for you. It is the only fence made of KONIK steel for extra strength and rust resistance "clear through." It has sturdy posts, bracing and fittings. Gates in many types and sizes are strong, easy to open. Continental fence is designed for the site and factory-built ready for quick erection. Trained erection crews are available, or a competent foreman will direct your workmen and maintain rigid inspection. ***(During the emergency KONIK will not contain the standard amounts of copper, nickel and chromium.)***

CONTINENTAL STEEL CORP. • Kokomo, Indiana

Offices in Principal Cities

CONTINENTAL SUPERIOR STEEL

CONTINENTAL
STEEL CORPORATION

SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc

WIRE: Bright Basic, Annealed, Coppered, KONIK, Tinned, Special Manufacturer's, etc.

mum because the nozzle wears slowly and evenly; since the original orifice is preserved without appreciable wear, the contour of the blast stream is maintained and the work is cleaned faster and more uniformly.

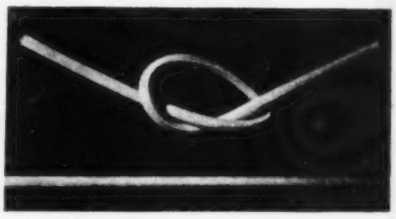
Additional features of this nozzle include: High finish bore; no soft spots to start uneven wear; non-metallic, thus reducing static to a minimum; does not "bell out" rapidly; excellent mechanical strength; adaptable to any equipment. Flange and the screw types are available. Adapters can be supplied for fitting the nozzle to any type of air blasting equipment. American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind.

Blackout Shades

For large areas of windows a blackout shade treated with a fire-resistant material is offered. This shade has roll-up equipment so that it can be rolled up to take advantage of all natural daylight. It also protects workers from sun glare and heat, and delicate machinery and products from flying glass and fragments. Hough Shade Corp., Janesville, Wis.

Fibrous Varnished Glass Sleeving

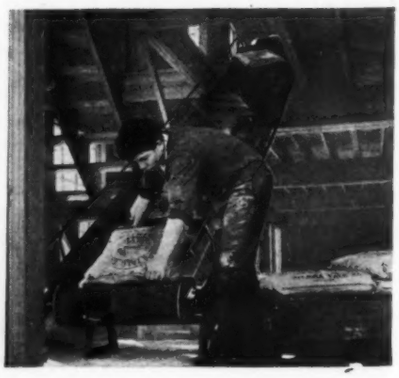
Fibrous glass varnished sleeving known as Turbo, in which the glass braid is processed with a natural oil base varnish, resulting in greatly enhanced dielectric values, is announced.



Such process, it is claimed, not only provides higher dielectric constants but also obtains a greater degree of flexibility, while the stretch factor is reduced to a practical minimum. Is precisely rounded, whereby objectional circumferential wrinkles and gaps are eliminated. William Brand & Co., 276 Fourth Ave., New York.

Belt Conveyor

Floor-veyor is a permanent power belt conveyor for floor to floor operation, loading installation, and boosters in gravity con-

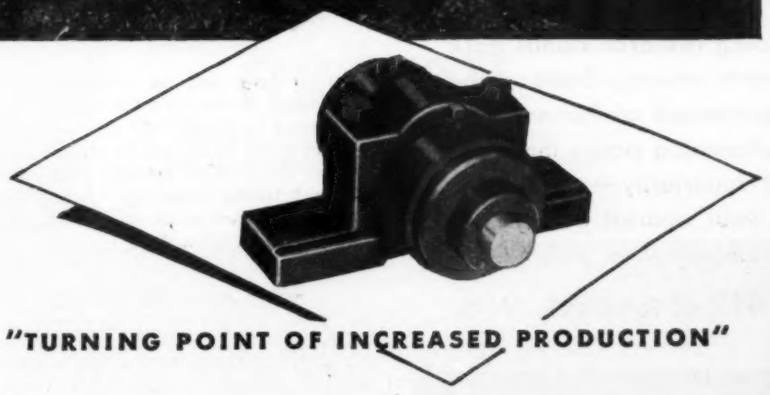


10 years Bucking the Bottom of the Sea!

Fafnirs solved a costly, time-wasting maintenance problem for this New England manufacturer of fireproof insulating material! They replaced the inefficient plain bearings on a large picker roll that "cleans up" dirty seaweed. They work in the midst of flying dust and sand, shells, stones and other foreign matter — all the filth from the bottom of the sea!

Yet, in all this muck and flying seaweed — meeting extreme conditions of shock and radial load — the two Fafnir Heavy Duty SAODD Pillow Blocks supporting the picker roll shaft have run *friction-free* for ten years with only an occasional greasing. The master mechanic of the plant puts it simply and effectively: "We used to be constantly running with the babbitt pot every noon hour, while the machine was stopped — now we only grease the Fafnirs about every six months."

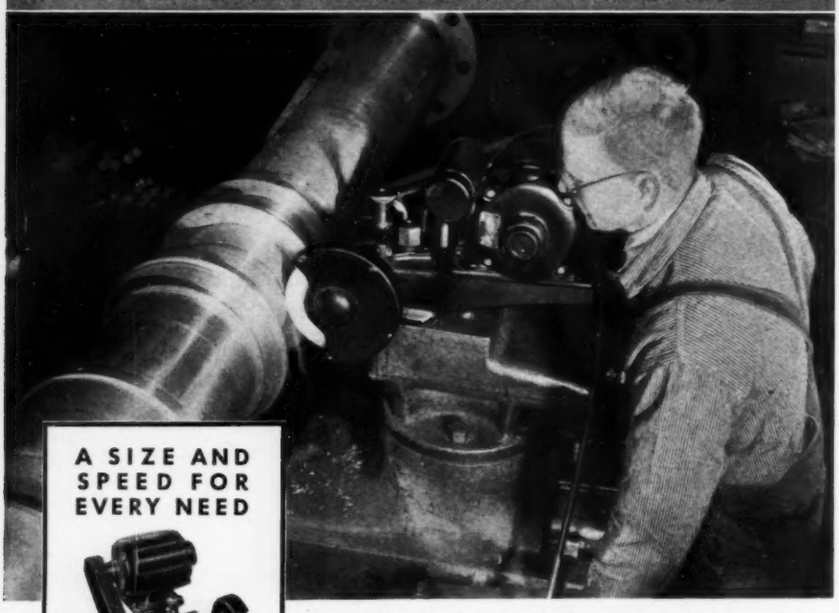
Your machinery and equipment may not be working under such tough conditions — but you may want to eliminate the cost and trouble of pampering plain bearings. No other ball bearing units make this turning point to economy and bearing satisfaction so easy to attain. Fafnirs alone offer the Self-Locking Collar — no machining, shaft shoulders or locknuts. Only Fafnirs have the long-life Balanced Design — deeper races, larger balls. And Fafnir offers every type and size of radial and thrust bearing, precision bearing, self-aligning bearing, sealed bearing and housed transmission unit. Distributor stocks in principal cities. The Fafnir Bearing Company, New Britain, Conn.



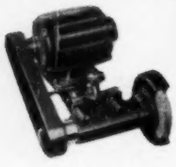
"TURNING POINT OF INCREASED PRODUCTION"

1/16 the thickness of a fly's wing!

YOU CAN GRIND THAT ACCURATELY WITH A DUMORE



A SIZE AND SPEED FOR EVERY NEED



"The Chief", with 1 h.p. motor, is a powerful grinding unit built to tackle the biggest and heaviest work—internal or external. Built for a wider range of work and greater output.

Despite low cost and small size, the "Tom Thumb" is the tool post grinder for small bench and shop lathes, built ruggedly enough for shop work.

● Delicately controlled precision . . . to .0001". . . this is regular, everyday performance with Dumore Grinders. Mounted on a lathe, planer, shaper, milling machine, or other machine tool, a flexible Dumore Grinder cuts costs . . . helps make more profit with your present machinery, and efficiently handles tool room and production grinding jobs, internal or external. Positive *performance* ...unfailing *accuracy*...*speed*...and, above all, *certainty* that Dumore Grinders will deliver peak performance under sustained operating loads...these are vital, intangible Dumore features.

A quarter-century of precision grinding research stands back of Dumore Grinders' ability to give steady, better-than-average performance. Honest, experienced craftsmanship—tested selected materials—a manufacturing policy that does not compromise with standards of superiority—all are built into every Dumore Grinder. Call your nearest Dumore Industrial Distributor today, and investigate their possibilities.

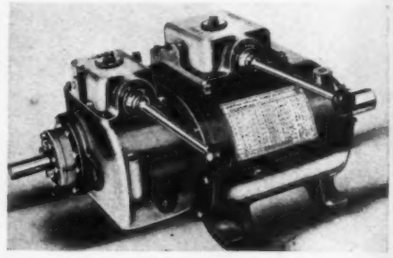
THE DUMORE COMPANY, 412-B RACINE, WIS.

Dumore PRECISION Grinders

veyor lines. Manufactured to standard designs, it is shipped as a unit ready for immediate installation. Special rubber-covered belt is standard equipment. Can be used for conveying a wide variety of boxes, bags, and other packaged materials. Control devices provide for simple, positive action in movement of materials. The Rapids-Standard Co., 535 Bond Ave., N.W., Grand Rapids.

Transmission

Super transmission with 30-hp. capacity for motorizing cone driven machine tools is announced. Can be used to motorize large slotters, engines, and turret lathes.

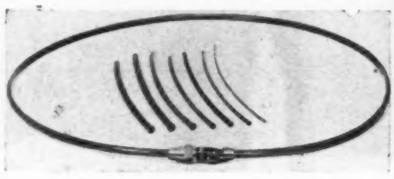


Has eight changes of speed in geometric progression of 1.29—maximum reduction of 6 to 1. All gears and shafts are made of alloy steel, heat-treated. Shafts run on antifriction bearings. Case is amply provided with oil seals. Western Manufacturing Co., 3428 Scotten Ave., Detroit.

Plastic Tubing

Saran is a thermoplastic whose characteristics enable it to relieve some of the immediate production difficulties due to metal shortages. Principal characteristics claimed are toughness and high resistance to moisture, brine, solvents, acids, and alkalies. Under fatigue tests, Saran tubing recently was flexed 2,500,000 times through a 5 deg. arc, 1,750 times per minute, without failure.

In addition to tubing, Saran will be fabricated in sheets, in thicknesses from $\frac{1}{32}$ to $\frac{1}{2}$ inch; and in compression molded



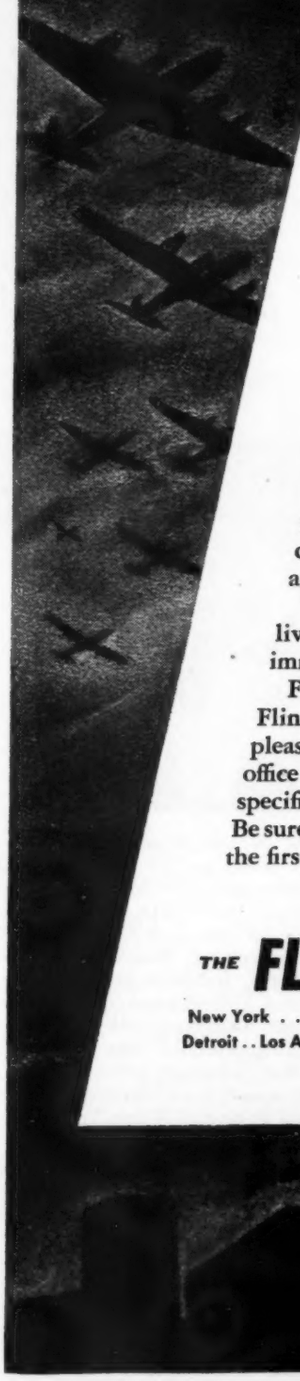
parts. Tubing will be fabricated in a wide range of sizes and thicknesses, ranging from $\frac{1}{8}$ to $\frac{3}{8}$ inch O.D.

Tubing can be jointed by standard flare type or compression fittings. Joined with standard tubing couplings. Acadia Synthetic Products Division of Western Felt Works, 4115 Ogden Ave., Chicago.

Blackout Material

Blackout coating known as Carbozite Standard Blackout Black, for industrial plant windows and skylights that meets all specifications and recommended practices, and features easy removal when danger no longer exists, is announced. Not a paint but a smooth flowing liquid coating,

Protect against air raids with BLACKOUT materials proved in England!



Special products, developed through Flintkote's British subsidiary, help you blackout buildings effectively and economically

The Flintkote Blackout Protective Systems have been proved in action. The effectiveness of these special products, included in those listed at right, was tested during England's heaviest air raids.

These specialized blackout materials . . . in liquid, roll and sheet form . . . are easily applied. They provide quick and effective concealment for factories in danger areas and plants working on vital war orders.

Most Flintkote distributors can now deliver these action-tested blackout products immediately.

For complete information about these Flintkote Blackout Protective Systems, please phone or write the nearest Flintkote office or use convenient coupon. Detailed specifications are available upon request. Be sure to have your plant protected *before* the first raid.

★ ★ ★

THE **FLINTKOTE** COMPANY

New York . . Atlanta . . Boston . . Chicago Heights
Detroit . . Los Angeles . . New Orleans . . Waco . . London

FLINTKOTE PRODUCTS
Proved and Ready

BLACKOUT STATIC COATING covers windows and skylights with dull, non-reflective black applied quickly by brush or spray and easily removed. Adhesive qualities help protect workers from the danger of flying glass.

BLACKOUT MEMBRANE TREATMENT—a tough membrane embedded in Blackout Static Coating—provides additional shatterproof protection. Especially useful for skylights.

FIRE RETARDENT MASTIC scientifically designed to prevent spread of roof fires caused by incendiary bombs.

BLACKOUT PANELS—easy to remove during daylight. Light-weight, strong and weatherproof. Installed indoors or out. Particularly useful for home or office protection.

BLACKOUT PAPER—waterproof felt or paper for temporary protection during emergencies.

CAMOUFLAGE PAINTS AND ADHESIVES conforming with Defense agency requirements are available. We are prepared to cooperate on individual concealment problems.

The Flintkote Company, *Building Products Division*
30 Rockefeller Plaza, New York, N. Y.

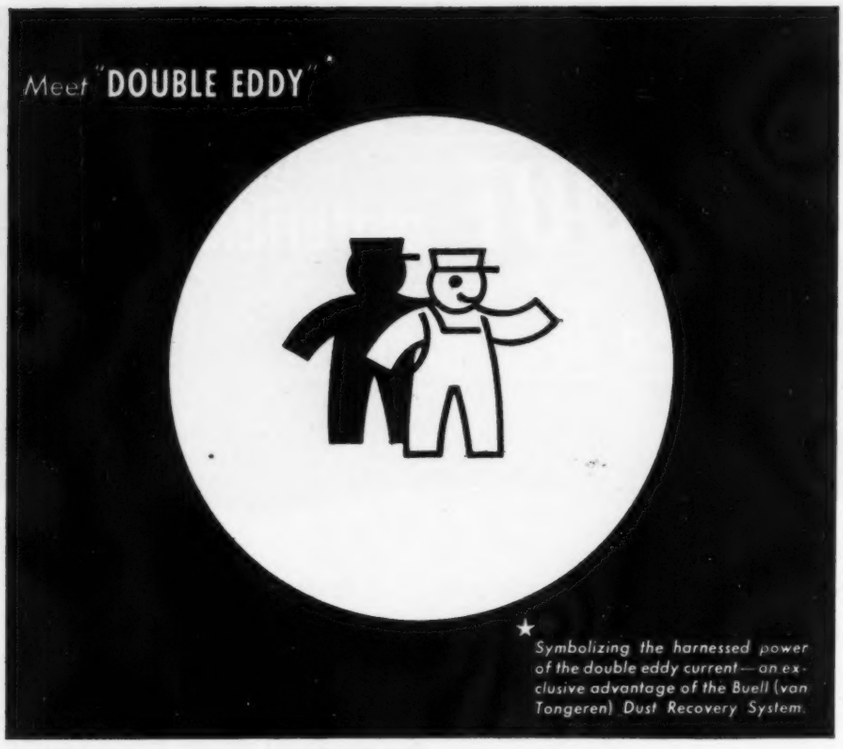
Please send full particulars regarding Flintkote BLACKOUT Materials and Protective Systems.

Name .....

Firm Name .....

Street FMM-2-42

City ..... *State* .....


Meet "DOUBLE EDDY"
Symbolizing the harnessed power of the double eddy current—an exclusive advantage of the Buell (van Tongeren) Dust Recovery System.

MISCHIEF-MAKER FOR EVERYONE BUT BUELL

"Double Eddy" is the little-man-who-saves-you-money on dust recovery. He works exclusively for Buell—and, on Buell equipment, has proved his ability as a dust recovery man all over the world, in every industry where dust is a problem.

The double eddy (an air current phenomenon present in all cyclone-type dust collectors) is a mischief-maker for everyone but Buell—causing trouble, cutting down efficiency. The reason? *No one but Buell can use the van Tongeren Cyclone!* This patented system embodies the only known method of harnessing the energy of the double eddy current to increase collection efficiency *on all dust sizes.*

For the complete story of "Double Eddy", send for our 24-page "Bulletin FA-2, Dust in Industry".

BUELL'S 6 PLUSES

These are the *plus* advantages that give Buell (van Tongeren) Dust Recovery Systems outstanding superiority...

- *High Recovery Efficiency*
- *Low First Cost*
- *Low Maintenance*
- *Long Life*
- *Unlimited Capacity*
- *Fractional Efficiency Performance Guarantees*

BUELL ENGINEERING CO., Inc.
12 Cedar Street, New York

Nation-wide service through offices of either Buell Engineering Co. or B. F. Sturtevant Co.

CONSULT BUELL *First* IN DUST RECOVERY
for Chemical • Rock Product • Metallic • Food • Flue or any other dusts

buell DUST RECOVERY SYSTEMS

manufactured from a pyrobitumen ore, refined and mixed with quick drying, volatile solvents and a secret ingredient which provides complete opacity and an absolutely gloss-free surface. Of particular interest is its ease of application and outstanding durability under even actively corrosive conditions.

Can be sprayed or brushed on quickly. Only one coat is required to assure complete protection against light penetration. Drying is completed in 6 or 8 hours. Will not sag, peel, chip, or check at temperatures ranging from –40 to 450 deg. F. Easily applied to glass.

Readily soluble in gasoline, kerosene, naphtha, or any light petroleum solvent, consequently will dissolve and wipe off glass readily when so desired, without disturbing other painted surfaces. Also removed with a putty knife or similar scraper, as coating remains flexible and is easily removed in a single layer without the use of any solvent or softening agent. Carbozite Corp., First National Bank Building, Pittsburgh.

Fork Truck

Lightweight, compact, power fork truck can lift, carry, and tier loads weighing up to one ton; operates efficiently in congested areas, in limited capacity elevators, in transport trucks and freight cars, and up ramps.

Christened the "Clipper," trucks are offered in six models, capacities 1,000,

1,500, 2,000 lb., with standard finger lifting heights of 60 to 108 inches, other special heights optional.

Gas-powered for 24-hr. continuous service, has an economical, 4-cylinder, industrial truck engine, front-wheel drive, rear-wheel steer, hydraulic lift and tilt. Self-starter and hydraulic brakes are standard equipment. The driver rides on a comfortable spring-suspended seat with all controls within easy reach, permitting safe operation at speeds from 1 to 7 miles per hour forward or reverse. Clark Tructrator Division of Clark Equipment Co., Battle Creek, Mich.

Heavy-Duty Unit Heater

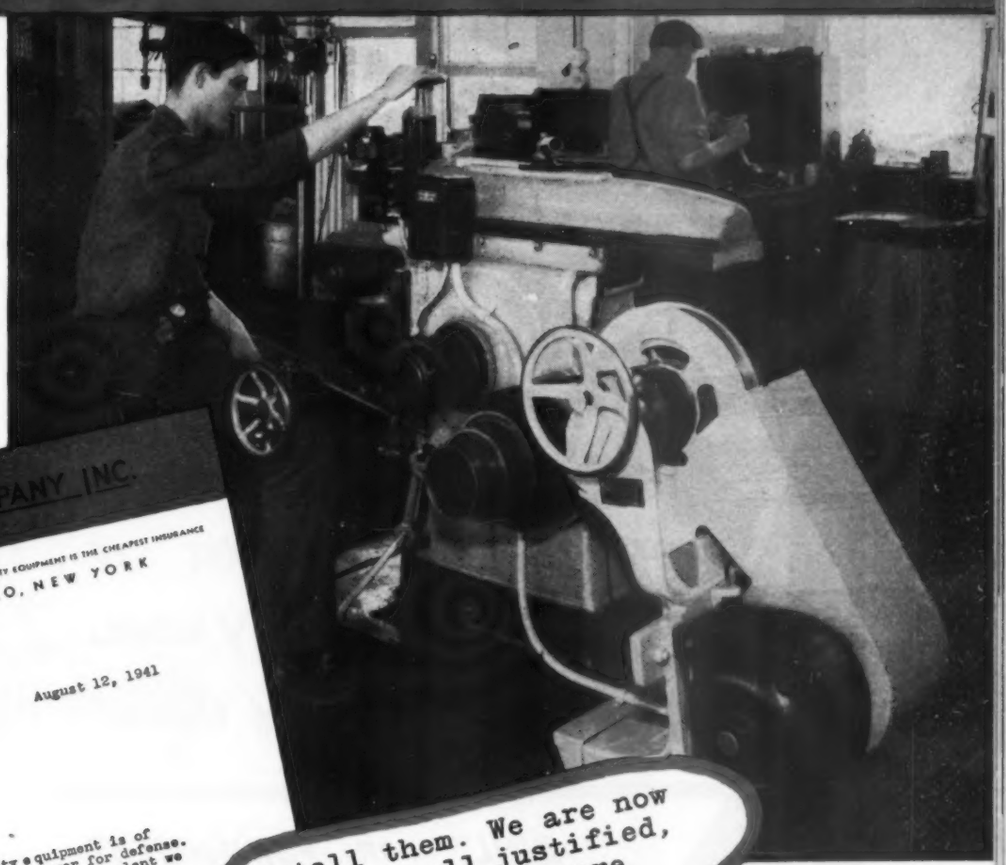
Known as the BBC-24 Janitrol series, design incorporates the multi-thermex heat exchanger and Amplifire burner. Unit is built up of a series of sections, each section having an input rating of 250,000 B.t.u. per hour. Each section is complete, having

"...your new TRI CLAD motor lives up to its name!"

REG. U.S. PAT. OFF.

WRITES RUSSELL S. EGGLESTON, SUPT. AMERICAN ALLSAFE COMPANY, BUFFALO, N. Y.

PROBABLY it's only natural that a manufacturer of safety equipment should put emphasis on protection features of electric motors when he is choosing them for use with new plant equipment. Here is the case of such a manufacturer who not only *sought* those features but *got them*—he selected Tri-Clad motors. Mr. Eggleston reports in his letter below:



AMERICAN ALLSAFE COMPANY INC.

INDUSTRIAL SAFETY AND FIRE PROTECTION EQUIPMENT — Allsafe PRODUCTS — THE BEST SAFETY EQUIPMENT IS THE CHEAPEST INSURANCE

1345 NIAGARA STREET • BUFFALO, NEW YORK

August 12, 1941

Mr. E. O. Jones
General Electric Company
1 W. Genesee Street
Buffalo, New York

Dear Mr. Jones:

Continued production of safety equipment is of paramount importance in conserving man power for defense. Consequently, when we recently moved to our new plant we decided to replace our old motor drives.

happy to inform you that our decision was well justified, for in operation and appearance these motors are more than satisfactory. The protection feature is a big help in our machine shop where there is danger of falling material.

We thought you would be interested in knowing how your new Tri-Clad motor lives up to its name. When we are in the market for more motors, we shall certainly specify Tri-Clad.

Yours very truly,
Russell S. Eggleston
Supt.
AMERICAN ALLSAFE COMPANY

Using new materials in better ways, General Electric builds the Tri-Clad motor to meet the many adverse operating conditions commonly found in industry. They are specifically designed to give *extra protection* against (1) physical damage; (2) electrical breakdown; and (3) operating wear and tear. Ask your G-E representative for full information on types and sizes now available. *General Electric, Schenectady, N. Y.*

BUILT FOR PROTECTION FIRST.....TO LAST

GENERAL ELECTRIC

250-97-8858

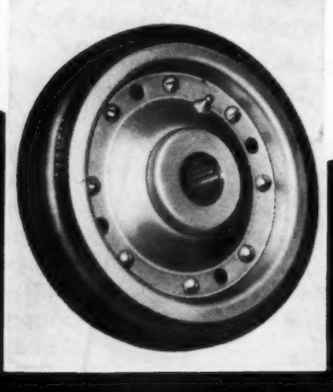
A SAVING AT EVERY TURN

Keep 'em Rolling..
Use **DARNELLS**

Darnell Dependability assures savings, service, safety, speed. A caster or wheel for every use.

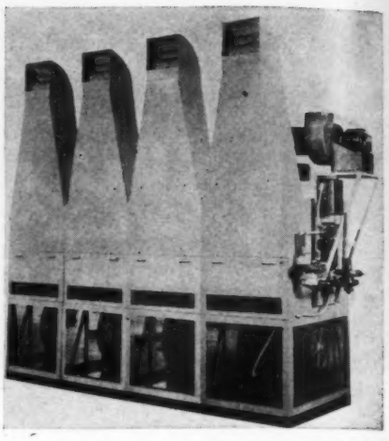
Recognized Standard of Quality

BUILT FOR PUNISHMENT



FREE Manual FOR THE Asking

DARNELL CORP., LTD., LONG BEACH, CALIF.
36 N. CLINTON, CHICAGO • 60 WALKER ST., NEW YORK

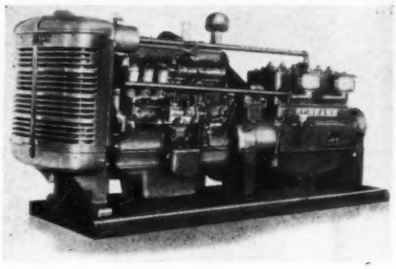


its individual heat exchanger assembly, pilot, limit control, and blower. Blowers of all sections are mounted on a common shaft and driven by one motor. All sections are securely attached to a heavy channel iron base to insure ruggedness and alignment of the fan shaft.

Will deliver 1,500 to 2,500 feet of air per minute and give a 100 to 125 deg. F. temperature rise. Surface Combustion Corp., Toledo.

Compressors

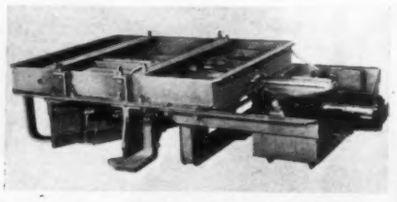
An addition to the line of compressors is Engine drive—in line compressor, built in sizes ranging from 120 to 600 cu.ft. displacement. For applications not reached by electric power service or where gaso-



line, oil distillate, or diesel power units are preferred as a driving medium. Standard assemblies in semi-portable and stationary types are available. Schramm, Inc., West Chester, Pa.

Track Switch

Electrically operated track switch, known as motor-driven Type H switch, developed for use on cab-operated, gravity, or automatic dispatch overhead materials handling systems, enables the operator to



pre-set the switch at some distance ahead while traveling, and thus save time lost when switching by hand. Likewise, indexes on gravity or automatic dispatch carriers may be set to actuate trippers which will cause one or several switches

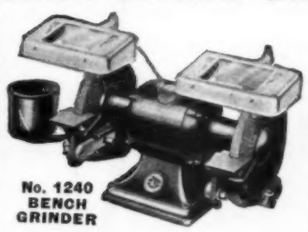
Here's why shops busy on the armament program insist on Delta Grinders

SHOPS that need more grinders to speed up war production, know definitely that Delta grinders offer such specific advantages as:

1. Special motors designed and balanced exclusively for Delta grinders.
2. Grinder wheels dynamically balanced to 1/100 inch-ounce.
3. Double sealed-for-life ball bearings—lubricated for life—sealed against grit.
4. Twin-Lite Safety Shield—eliminates need for goggles—provides illumination on both sides and face of wheels.
5. Fully machined, easily adjustable tool rest—rigidly mounted adequate guards.

No. 1246 Pedestal Grinder

Also Bench Models



No. 1240 BENCH GRINDER

Built in both single phase and three phase models, bench and pedestal types, there is a Delta grinder to fit every shop. The motor-driven bench grinder also incorporates all of the latest Delta design and construction features . . . Twin Lite Safety Shields . . . double seal New Departure ball bearings . . . strong and efficient wheel and spark guards . . . absolute freedom from vibration (due to especially balanced Aluminous Oxide wheels).

Send for Catalog

Send coupon below for Delta Catalog giving full details and specifications on the complete line of Delta grinders.

Other Delta Low-Cost Machines

A complete line of single and multiple spindle 14" and 17" drill presses in slow and high speed models.

METAL CUTTING BAND SAW

cuts almost anything in metals and plastics from jig and fixture bases 1 ½" by 2" thick to draw die segments 6" thick.

CUT-OFF MACHINE

cuts speedily and to exact lengths a wide variety of materials. Priced at one-half the usual cost of machines of this type.

DELTA MILWAUKEE

The Delta Manufacturing Company
617-BE. Vienna Avenue, Milwaukee, Wis.

Please send me your special Grinder Bulletin giving full details and specifications on the complete line of Delta Grinders. ☐ Also send me your latest Delta catalog of industrial power tools.

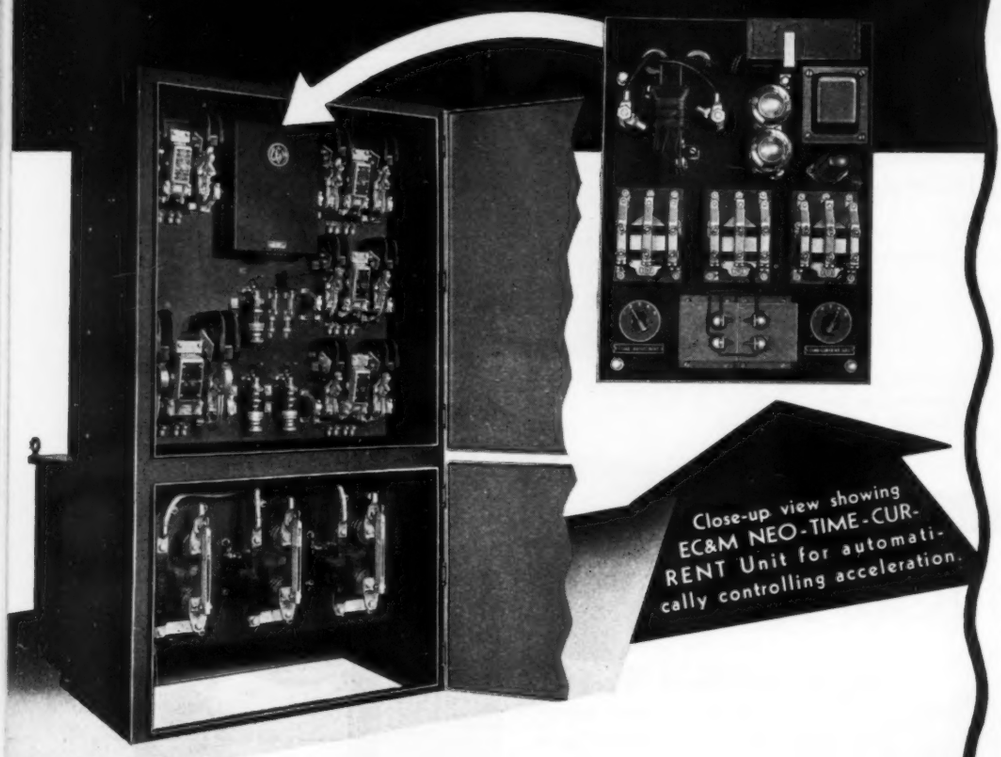
Name .....

Address .....

City ..... State .....

Completely Assembled for QUICK Installation

EC&M 2300 VOLT WOUND-ROTOR MOTOR STARTER



Close-up view showing EC&M NEO-TIME-CURRENT Unit for automatically controlling acceleration.

HERE is a new design EC&M Push-button-operated Motor Starter for 2300 Volt Wound-rotor Motor driving a Dixie Mill Crusher. Of unit-type, it is *complete in every respect*—with self-contained disconnect switches, secondary control panel and primary magnetic contactor entirely enclosed as a single unit.

Ready to be placed in position and connections easily made to the power leads and motor terminals, this unit-assembly *offers many advantages.* It quickens installation time. The installation is shock-proof yet readily accessible, when needed, through heavy-gauge, easy-operating enclosing doors. For adverse atmospheric conditions, doors may be gasketed to exclude dust or corrosive fumes.

As a companion to EC&M Unit-type Synchronous Motor Starters, this new design wound-rotor starter makes a complete line of EC&M totally enclosed starters. Ask for Booklet 67 showing typical examples of EC&M Completely Assembled *Steel-clad* Motor Control-

THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

THE ELECTRIC CONTROLLER & MFG. CO.

CLEVELAND OHIO

● HEAVY DUTY MOTOR CONTROL ● BRAKES ● LIMIT STOPS ● WELD TIMERS ● LIFTING MAGNETS

to take the positions desired. Switch consists of two main assemblies—an outer supporting frame and an inner sliding frame. The outer frame is designed for bolting rigidly to the superstructure. The inner assembly carrying a straight and a curved rail, rides on multiple easy-operating rollers, and is set in position by a motor-driven cam through a lever arrangement. Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Electric Tractor

The tractor is a modification of the Mercury "Tug" electric tractor, in which the seat, floor, brake pedal, steering, and travel controls have been lowered and a protective metal is canopy provided. For use in tunnel operation or where low overhead obstructions occur. Drive axle, double re-

duction spiral bevel and spur gear. Anti-friction-bearing mounted throughout. Motor, high overload capacity, rubber cushioned. Controller, mercury snap-action mechanical contactor controller. Brakes, internal expanding type. Frame, all-welded, steel-plate construction. Springs, semi-elliptic, front and rear. Mercury Manufacturing Co., 4110 S. Halsted St., Chicago.

Oil-Level Relay

Oil-level relay for oil-filled cable intended for use with gravity-feed-type reservoirs, has a signal tripping action of improved design, and is more compact. All wiring is enclosed in an oil-free compartment, eliminating the dangers of faulty operation due to the effect of oil on the internal

"It gives me pleasure to advise you that your organization has been chosen to receive the flag of the Bureau of Ordnance and the Navy 'E' pennant in recognition of your outstanding efforts in the production of ordnance materiel vital to our national defense. Recent events have made this award of even deeper significance than any which have been made in the past."

Secretary of the Navy Frank Knox, in a letter to Monsanto.

"E" stands for teamwork!

Among the crews of Uncle Sam's warships and naval planes, the Navy "E" is one of the most coveted and respected honors the men of a single gun turret or an entire battleship can win.

It is a symbol, not of individual brilliance, but of championship teamwork . . . teamwork that only long, gruelling hours of actual practice could perfect.

The same tradition governs the award of a Navy "E" to an industrial plant.

The "outstanding jobs" which win an Ordnance Bureau flag and "E" pennant are not the work of one brilliant "lone wolf" in the research department—or a single, capable executive. They are the result of teamwork that only starts with the quarterback in the front office and includes every man in the organization to the policeman on the plant gate . . . teamwork that only long years in the peacetime service of industry could perfect to the peak of efficiency demanded by a nation at war!

Monsanto is proud to fly the Navy "E" in recognition of past performance . . . glad to accept the responsibility it imposes for future performance. MONSANTO CHEMICAL COMPANY, PLASTICS DIVISION, SPRINGFIELD, MASSACHUSETTS.

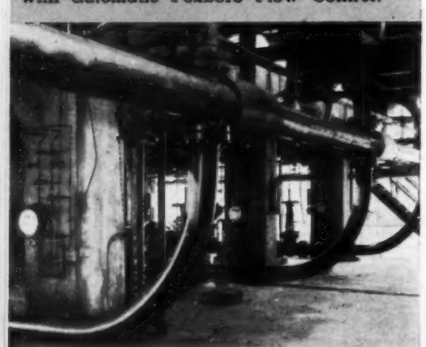
MONSANTO PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

"GREEN HANDS"

can supply your needed man power!

Constant supervision by skilled men is saved when pump rooms are equipped with automatic Foxboro Flow Control.



Even important jobs like airplane engine testing can be reduced to simple routine by application of Foxboro Instruments.

At your employment gate each day are probably many intelligent "green hands". . . men and girls who could speedily learn to handle even vital operations, if you gave them the unerring guidance of Foxboro Instrumentation!

With Foxboro Measurement or Control Instruments on critical processes, guess-work is eliminated. Temperatures, pressures, flow rates and liquid levels are exactly measured and clearly, continuously recorded to assist both operators and supervisors. In many instances, completely automatic control more accurate than any manual control is furnished by a simple dial-setting. Even your "old hands" can work with greater assurance!

Learn what Foxboro can do for your plant. Write for recommendations on any critical production step involving controlled Temperature, Pressure, Flow or Level. **The Foxboro Company, 24 Neponset Avenue, Foxboro, Massachusetts, U. S. A.**

FOXBORO

Reg. U. S. Pat. Off.

MEASUREMENT AND CONTROL SYSTEMS

wiring of the relay. The coupling between the float and the operating mechanism is magnetic.

Alarm switch is indirectly controlled by a hollow steel ball which fits inside the walls of a cylinder-shaped chamber inclosed in a nonmagnetic housing. At its lowest point, the ball actuates a magnet which pulls down a hinged arm, causing the alarm switch to close. An excess of oil raises the ball to the top of the chamber, where a second tripping switch is located. The instrument's two switch-controlling magnets may be adjusted to cause an alarm before the oil supply has been exhausted or before it rises too high. General Electric Co., Schenectady.

Safety Switch

Bull Dog Vacu-Break safety switch with "clampmatic" contacts and front operated rocker type handle secures and maintains perfect clamp pressure of the switch contacts when in the "on" position, yet a normal push of the operating handle will make or "break" the circuit with almost automatic ease. Its simplified operating mechanism transmits a direct over-center action on the switch contacts insuring

positive make and break. Arcing chamber is of simpler design and more durable material. Front-operated rocker handle, push-type, eliminates lost motion mechanism, knife-edge two-point bearing gives extreme sensitivity for positive on and off operation. Available in capacities from 30 amp. to 200 amp. inclusive in both the Master (Type "A") line and the Standard (Type "C") lines. Bulldog Electric Products Co., 7610 Jos. Campau Ave., Detroit.

Blackout Light

Now available for shipment is a blackout lighting unit, that follows the requirements of the British Air Raid Precaution Specifications.

The usual spacing between units is 100 feet with a mounting height of 20 feet. Under these conditions, using a 6-watt S-14 lamp, illumination will average 0.0002 foot-candles, with a maximum of 0.0004 foot-candles (starlight on a clear night).

Unit can be made to accommodate larger wattage lamps. In the present mechanical construction the range is from

THE LINCOLN CENTRO-MATIC LUBRICATING SYSTEM

Girds the "BIG BOYS" for a 7 day week

This massive dry press, in the modern plant of the A. P. Green Fire Brick Company, Mexico, Missouri, is equipped with a Lincoln CENTRO-MATIC Lubricating system.

In this CENTRO-MATIC installation, the lubricant is supplied to the line by a Lincoln Model 1787 Air-Motor operated, 400-lb. drum pump, (illustrated at left). Lubricant is pumped direct from the original refinery container, and the system is fully automatic in operation.

Increases Life of Bearings ...Lowers Maintenance Cost...Pays for Itself in a Short Time

With War Production stepped up to a new high, the need for positive and speedy lubrication of all bearings on machinery and mechanical equipment becomes a factor of vital importance. "Out of service time," because of bearing failure, cannot be tolerated. The "Big Boys" must stay on the job if production schedules are to be maintained.

Cut production delays and lower lubrication and maintenance costs by equipping your machines with Lincoln CENTRO-MATIC Lubricating systems. They are simple to install and consist of a number of injectors—one for each bearing, each connected to the bearing by copper tubing, and each individually adjusted to discharge the required amount of lubricant needed. The injectors can be mounted singly, or in manifold and are supplied with lubricant from a central pumping unit which can be either hand operated, semi-automatic, or entirely automatic with time clock control.

Send us the specifications of the machinery to be lubricated. Our engineers will gladly make recommendations. No obligation.

Send for free copy of descriptive Bulletin No. 888

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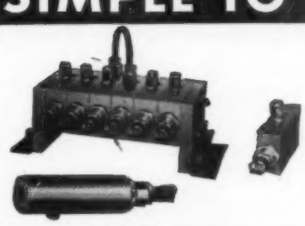
LINCOLN ENGINEERING COMPANY

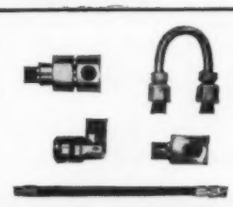
Pioneer Builders of Engineered Lubricating Equipment

ST. LOUIS, MISSOURI

SIMPLE TO INSTALL



Lincoln CENTRO-MATIC injectors are furnished in two types—Block type for manifold grouping. Cylindrical type for widely spaced bearings.



Lincoln grease line accessories—High pressure fittings and adapters, connectors, connector tube assemblies, compression couplings, bushings and lubricant hose.

Lincoln Model 1840, Fully-automatic Electric Lubrigun, 30-lb. capacity.

Lincoln Model 1805, Manually operated CENTRO-MATIC pump, 2-lb. capacity.

"MOVE ON!"

Yuh don't belong here!"

THE guard outside your gate may protect your plant from dangerous aliens, spies and saboteurs. But—how about the destructive enemies ALREADY INSIDE?

DUST is one of the worst of these. It attacks machines, products and the efficiency of workmen —without warning—striking steadily and continuously—deducting its costly damages DAY AFTER DAY FROM YOUR PROFITS.

PUT AN END TO THIS DUST LOSS RIGHT NOW! Protect your plant, products and production by eliminating dust—with Pangborn all-metal frame, cloth screen Dust Collectors. A size and type for every requirement. Economical to install. Costs practically nothing to operate and maintain.

For a clear presentation of Industrial Dust Control for Defense—"come to Pangborn" today.

PANGBORN

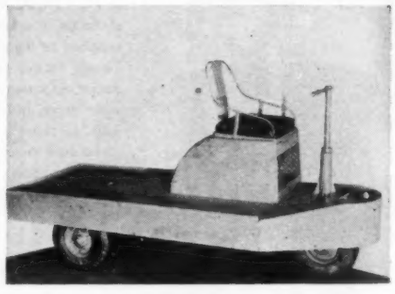
WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

6 to 25 watts. When a 10-watt lamp is used, average .0004, maximum .0008 foot-candles are secured; with a 15-watt lamp, average .0008, maximum .0016; with a 25-watt lamp, average .0014, maximum .0028. Holophane Co., 342 Madison Ave., New York.

Shop Truck

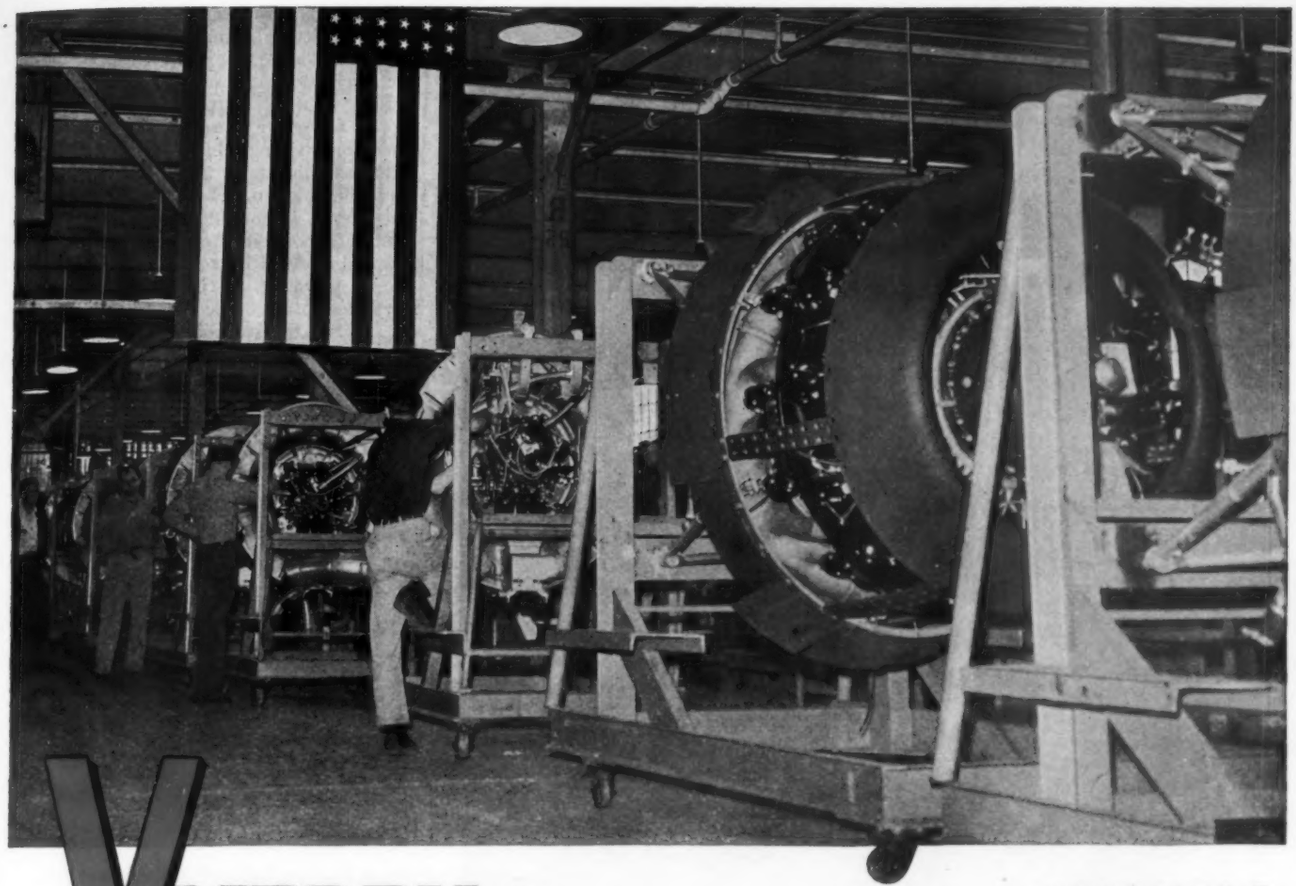
Announcement is made of a ½-ton industrial shop truck, known as Buda Chore Boy. Weighs 800 pounds. Is fast, with quick accceleration, foot throttle speed control. Handles easily at all speeds. Maximum speed 15 miles per hour. Driven by powerful, low-maintenance, 4-cycle, air-cooled, 7.7-hp. engine, averaging approximately 35 to 38 miles per gallon of gas.



Provided with a heavy-duty friction drive, with both forward and reverse speeds and neutral position for idling. Load capacity for Chore Boy is 1,000 lb. Loading space is 12.8 square feet. Brake is automatically applied the instant the operator leaves the seat. Will not operate when driver is off seat. Will hold truck fully loaded on an incline or ramp. Only 37 inches wide, three-wheel construction permits turning in radius of 7 feet 3 inches. The Buda Company, Harvey, Ill.

Vacuum Seal

Rotorseal is the name of a device designed to act as a positive seal at the point of transmission, when air or oil, under pressure or vacuum, is transmitted from a stationary member to a rotating member, or from a rotating member to a stationary member. In construction, Rotorseal con-



VICTORY *begins on millions of* WHEELS

. . . Speed . . . is the theme as America's industries roll ahead

From designer to shipping room door—production processes of all kinds are being streamlined to a new tempo. Materials handling, once merely hit-and-miss hauling and toting, now speeds forward on scientifically engineered, mobile equipment. And Faultless Truck Casters, built to do jobs faster and easier, are saving man-hours... speeding the flow of defense materials... raising the efficiency of production programs. If you have a materials handling problem write to

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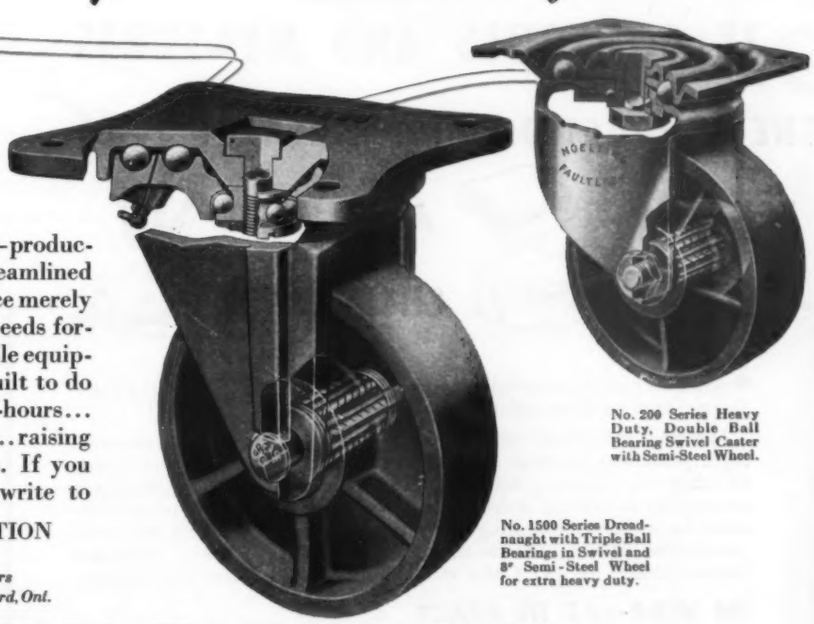
For Half a Century Makers of Industrial Casters
Offices in Principal Cities—Canadian Factory: Stratford, Ont.



No. 200 Series Heavy Duty, Double Ball Bearing Swivel Caster with Semi-Steel Wheel.

No. 1500 Series Dreadnaught with Triple Ball Bearings in Swivel and 8" Semi-Steel Wheel for extra heavy duty.

FAULTLESS

CASTERS SPEED UP DEFENSE PRODUCTION

IT CONTROLS AND MEASURES

THE PRODUCTION OF...AIRCRAFT

TEXTILES ARMAMENT

FOODS CHEMICALS

● America's most powerful weapon is PRODUCTION...tremendously *fast* production demanding highly *accurate control!*

Whether it's aircraft propeller balancing... gunpowder proportioning...parachute weaving...force measuring...food packing...or scores of other vital phases of war production...Toledo Weighing Machines are rapidly answering industry's call for control duty. Write immediately for whatever weighing information you need to help win your production battles. Toledo Scale Company, Toledo, Ohio. Sales and Service Offices in 181 Cities throughout United States and Canada.

IN WAR—AS IN PEACE

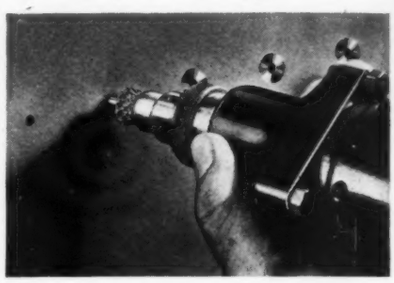
INDUSTRY LOOKS TO **TOLEDO**

FOR ALL TYPES OF **SCALES**

sists of a shaft, rotating in a sealed double-row antifriction-bearing mounted in the housing. The seal is achieved by a non-metallic seal nose bearing against the face of the rotating shaft. Bearing surfaces, lapped for positive seal, are self-adjusting, by a spiral spring which compensates for wear, and maintains a positive seal with minimum friction. The device is built for long service without attention. Can be run continuously in either direction and can be reversed as often as necessary. Suitable for use at pressures up to 150 lb., at temperatures up to 200 deg. F. and speeds up to 2,000 r.p.m. Available in five sizes, with passages ¼ to 1½ inches. Kellogg Division of American Brakeshoe & Foundry Co., 97 Humboldt St., Rochester, N. Y.

Brush for Rivet Holes

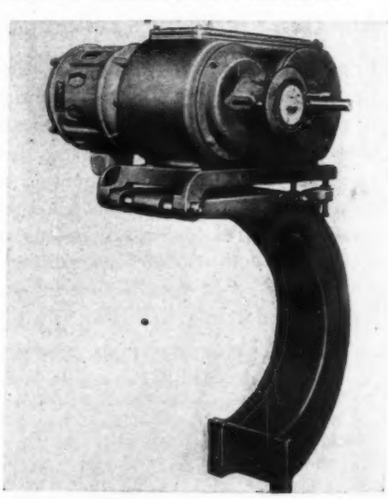
A tiny brush, no bigger than a finger, designed particularly for the aircraft industry but applicable to many other industries, has recently been developed. Used to



clean a small area from around rivet holes, bolt holes, etc. It is a tiny end-brush made of wire, and incorporates a special pilot rod to fit into the hole. Tests prove that the brush does not clog. Osborn Manufacturing Co., Cleveland.

Machine Tool Drive

Motorized variable speed drive for machine tools which eliminates necessity of building a special support or bracket in order to mount variable speed control units on machine tools is announced.



Utilizes either the Reeves Vari-Speed Motordrive or the countershaft type Vari-Speed motor pulley. Comprises a symmetrical, compact assembly of constant speed driving motor, variable speed unit, and mounting bracket which can be at-

A CONSERVATION CONTROL PLAN

to aid Industry wage war on waste

Henry Disston & Sons, Inc., has initiated a nation-wide plan to help conserve vital war materials, working time and tools.

Any plant can put the plan to work in its own shops without charge or obligation and so provide individual instruction cards for each one of its employees who uses any one of 35 kinds of cutting tools for metal, wood, plastics, and other materials. Cards are provided for files, hack saw blades, metal cutting and wood cutting circular saws, planer knives, paper knives, veneer knives, etc. It is not necessary to be a user or purchaser of Disston products to participate in this national program.

From the OPM, George T. Weymouth, Chief of the Industrial Salvage Section, Bureau of Industrial Conservation, sends this comment on the Disston Conservation Control Plan:

"I wish to take this opportunity of acknowledging to you our appreciation of your efforts, and to tell you that this effort reflects precisely what we would have every industrial plant in the country undertake. The entire program meets, therefore, with our approval."

CONSERVATION ★ SERVES EVERYONE ★

HENRY DISSTON & SONS, INC.
ESTABLISHED 1840
TRADE MARK
REG. U.S. PAT. OFF.

Essentially the Disston Conservation Control Plan consists of (1) Instruction Cards for workmen on the correct choice, proper application and right care of tools—not only to conserve materials, save time and lengthen tool life, but to improve workmanship and boost production as well. (2) Bulletin Board Posters and similar promotion material to stimulate the interest and cooperation of every employee. (3) Engineering Service in the selection and application of tools in your plant. With many years of broad experience in a great variety of industries, Disston engineers know how to fit the tool to the job to be done—and help you eliminate waste, get more work done and produce better results.

Complete information on the Disston Conservation Control Plan and how you can cooperate in the national war on waste will follow your inquiry. Write today. Henry Disston & Sons, Inc., 224 Tacony, Phila., Pa., U. S. A.

6,000 BOMBERS

Could Be Built With the Money Lost in One Year from Industrial Accidents!

—Authority,
National Safety Council

Play Safe —USE

INLAND 4-WAY FLOOR PLATE

for Safe Traction, Strength and Long Wear!

INLAND STEEL CO.

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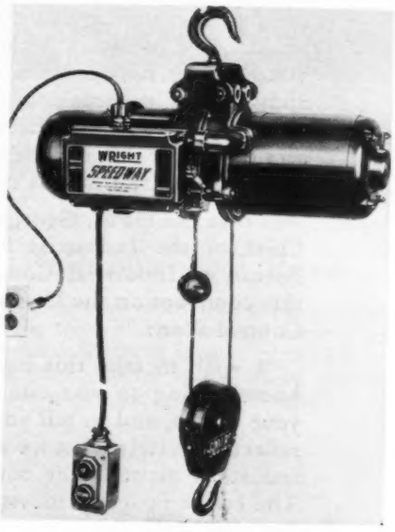
tached to most machine tools by four capscrews. Smooth, quiet, vibrationless transmission of power from drive to driven machine is claimed, and any speed within the limits of the particular unit applied, may be instantly obtained by turning a handwheel and without stopping the driven machine.

Two sizes of bracket are available. With the Motordrive, capacities are from ¼ to 10 hp., depending on size of unit used, and speed ratios from 2:1 through 6:1 are available. Single reduction gear reducer is available if required.

Using the Vari-Speed Motor Pulley, capacities range from 3.4 to 7½ hp. and cover speed ranges of either 2¾:1 or 3:1 ratio. Reeves Pulley Co., Columbus, Ind.

Electric Hoist

The Speedway, a lightweight, compact wire-rope electric hoist is obtainable in capacities from 250 to 1,000 pounds. Portability, flexibility, and accessibility are outstanding features claimed for this hoist. It is ready to go to work anywhere, plugged in on a lighting circuit, or used with conductor systems. Features include pushbutton control, weatherproof, acid-proof, preformed hoisting cable on drum winding, eliminating slack chain fouling



loads, safety limit switches, safety load blocks. Furnished for lug, hook, or trolley suspension. Can be mounted parallel or crosswise to runway beam when used with trolley. Furnished for 110 or 220 volt, single-phase, 60-cycle current, also for 220 or 440 volt, 3-phase, 60-cycle. Wright Manufacturing Division of the American Chain & Cable Co., Inc., York, Pa.

Smoke Alarm

Photoswitch photoelectric smoke alarm, Type A25C, increases combustion efficiency by indicating the degree of smoke density passing through the stack, and signaling conditions of efficient combustion and excess smoke on green and red signal lights. The equipment includes photoelectric control, light source, and indicator.

Control and light source are mounted

LIGHT THE WAY TO VICTORY

MAKE every hour count—with Day-Brite Fluorescent Fixtures . . . They light the way to Victory, from details on the drafting board to accuracy on the production line . . . They limit eye fatigue, help work to closer standards, insure spoilage reductions, and keep up morale through every hour of a full work week!

For greater man-hour output—for more speed with less strain—turn your lighting problems over to Day-Brite Engineers . . . Call in your local Day-Brite representative—he will give you "on-the-ground" engineering assistance, backed by an experienced organization geared to accurate production in a large, streamlined, modern plant.

DAY-BRITE LIGHTING, INC., 5415 Bulwer Ave., St. Louis, Mo.

TELL US WHAT YOU NEED

Factory Lighting of all types—Office and Engineering Dept. Lighting to fit every requirement—single units or long, continuous strips—open and enclosed troffers, recessed or exposed—all engineered to fully utilize the higher efficiency of fluorescent . . . *SEND FOR CATALOGS* with design illustrations and complete specificational data.

DAY-BRITE LITEWAY
For Engineering Depts.

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DayBrite Rivals Daylight

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THE COMPLETE LINE OF FLUORESCENT LIGHTING FIXTURES

Nationally distributed through all leading electrical supply houses.

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37

HIGHER TEMPERATURES TO
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AIR HEATERS
INDUSTRIAL OVENS

Faster finishing can meet your need for increased capacity without enlarging your plant. Ross Air Type Heater Systems by safely increasing and controlling baking temperatures greatly reduce the baking time.

In the automobile and other industries Ross Air Heaters and Ovens have made possible substantial savings in fuel cost, floor space and investment in equipment. They have secured better quality of output, greater flexibility and absolute thermostatic control.

Recommendations by Ross are based upon long experience with finishing problems. We maintain complete laboratory facilities. Consult us on your requirements.

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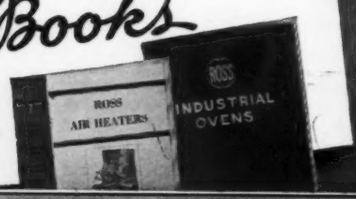

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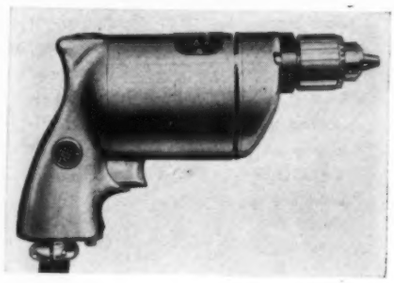
ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

on opposite sides of the flue or stack, aligned so that the light beam projects to the eye of the photoelectric control. The photoelectric control is wired to Densometer D4 which may be located at any point in the power plant for observation by the engineer. The meter gives a continuous indication of the smoke density. A small green signal light signals efficient combustion and a large red bullseye indicates when excessive smoke is passing through the stack. Photoswitch Incorporated, 21 Chestnut St., Cambridge, Mass.

Drill

Four models of a heavy-duty Holgun especially engineered to the heavy production requirements of airplane, aircraft accessories, and similar fabricating and



assembly operations, include end handle, standard speed model; end handle, low speed model; side handle, standard speed model; side handle, low speed model. All are adapted to a wide variety of ¼-inch drilling operations. The standard speed end handle model weighs 60 ounces, is 7¾ inches long. All units have 2-pole instant-release switches, with pistol grip and trigger switch control, suited to either right or left hand operation. The Black & Decker Mfg. Co., Towson, Md.

Plating Tank Nets

An aid to good electroplating practice has recently been placed on the market. Known as HVWM tank net, it is placed in plating tanks so that any work dropped may fall into the net and be easily recovered by simply lifting the net out of the solution. Of ¼-in. stretched mesh,

Now! COMPLETE PROTECTION IN A 2300-VOLT CONTROL UNIT

- ✓ Short-circuit Protection
- ✓ Accurate Overload Protection
- ✓ Safety for Operating Personnel

LET'S take this new 2300-volt, 60-cycle control unit apart and see what you get. It's really a great team—the EJ 2 current-limiting fuse and our dependable heavy-duty oil-immersed contactor. We have combined them in one metal-enclosed unit to give you complete protection plus long-lived operation.

1ST THE EJ 2 CURRENT-LIMITING FUSE

EJ 2 fuses mean split-cycle short-circuit protection. Current is cut off in less than a quarter cycle and cleared in less than a half cycle—long before the short has had time to harm the starter or motor. Changing these fuses is a simple, speedy operation. Also, they have a disconnect feature, which makes possible complete isolation of individual starters without causing the entire motor line to be shut down.

2ND THE OIL-IMMERSED CONTACTOR

This heavy-duty, corrosion-resisting contactor has a record of years of successful service. Extra-heavy, self-cleaning copper tips, wide metal bearings, and extra-flexible, copper-braided shunts combine to give you a contactor that will withstand more than a million operations with only routine maintenance. Isothermic overload relays calibrated accurately against the actual characteristics of your motor protect both it and the starter against damage from sustained overloads.

The current-limiting fuse and the oil-immersed contactor are mounted together in one metal-enclosed unit—a compact, easily installed, completely protected motor control.

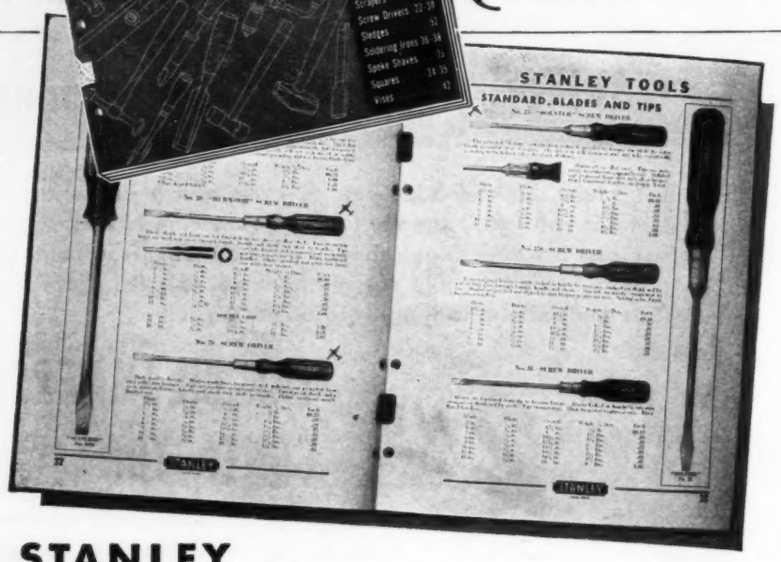
You'll want complete information. Our new bulletin tells not only about protection, but also why you can expect long life with low maintenance costs from this new control. Ask the nearest G-E office for GEA-3660. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

Your Handiest Guide to GOOD TOOLS

"Ready-referenced" . . . "Easy to use" . . . "A handy, complete guide to the kind of tools I need in my shop" – that's what users are telling us about the Stanley Industrial Tool Catalog No. 50. We urge you to use it as *your* guide in buying!

A Complete Line of Tools Under Each Index Listing



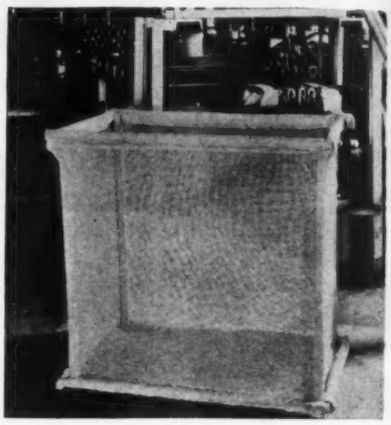
STANLEY SCREW DRIVERS

Over 200 different Stanley Screw Drivers and Bits are described, typical of the completeness of each classification of tools. Included is a full line of drivers for Phillips Recessed Head Screws and Bolts. Write for a copy of Catalog No. 50 today! Your local distributor is ready to supply Stanley Tools to meet your maintenance and production needs.

STANLEY
TRADE MARK

STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
151 Elm Street, New Britain, Connecticut
THE TOOL BOX OF THE WORLD

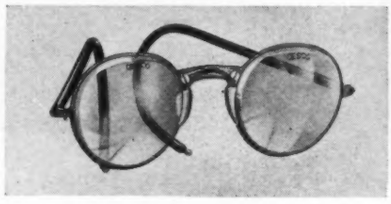
hung square, 6-thread medium twine, made to dimensions as specified. Tape loops are sewn in along top and bottom of both ends and sides, large enough to accommodate a rod up to 1¼ inches in diameter. Can be used in nickel, cyanide copper, Mazic zinc, acid zinc, and cad-



mium solution. Not suitable for alkaline cleaners or sodium stannate tin solutions. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Spectacle-Type Goggle

More wearing ease and comfort are claimed for the "comfort bridge" spectacle-type goggle. Bridge is a single unit, molded out of non-flammable plastic material, including wide bearing jumbo pads which distribute the weight evenly and float the frame without undue pres-

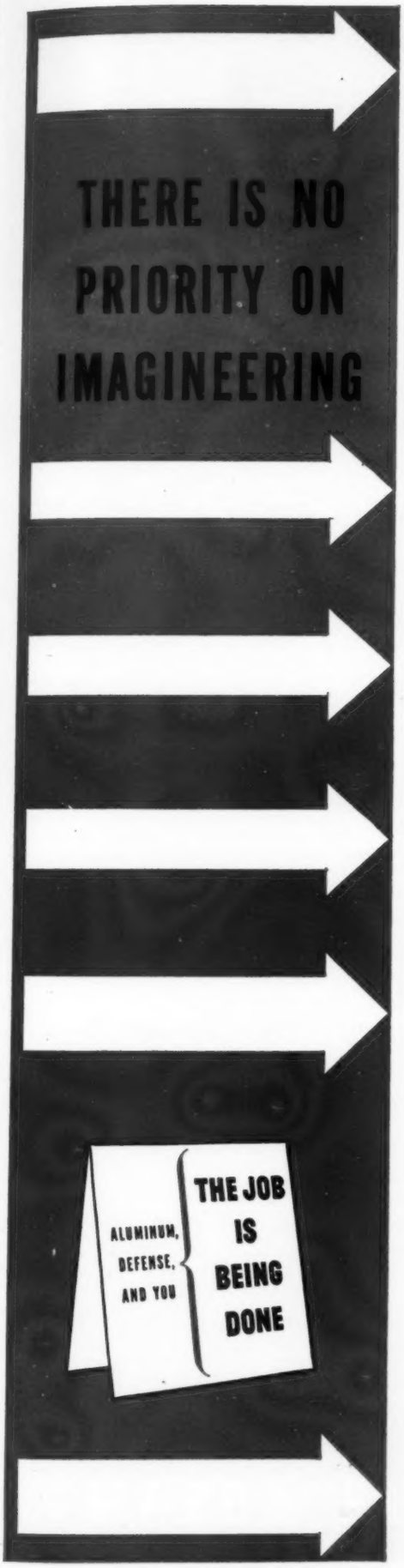


sure across the bridge of the wearer's nose. Designed for flexibility, both the bridge and pads become self-adjusting to varying nose widths. Available in three bridge widths: Narrow, medium, and wide, and furnished with 50-mm. lenses or drop oval shapes, in lenses which meet all government specifications. Transparent side shields and leather padded side shields are also available with all 'comfort-bridge' models. Chicago Eye Shield Co., 2331 Warren Blvd., Chicago.

Tube Checker

Self-contained tube checker for industrial type electronic tubes is provided with seven sockets, may be used to check virtually every well-known make and type of industrial tube (except ignitrons). Special tubes may be checked through the use of socket adaptors.

The checker provides, through a 1-in. cathode ray tube, a visual analysis of plate current, while high vacuum tubes can be checked with the milliammeter provided. Housed in black crackle-finish box with sloping control board, instrument is provided with adjustments for intensity, hori-



EVERY INDUSTRY, every responsible man in industry, has the present duty of answering two questions.

FIRST ONE IS: Are we, am I personally, doing everything within my power for the war? Our answer here at Alcoa is a plain, unqualified, yes.

NEXT QUESTION IS: What are we doing about the day when we will all need business, which is the polite way of saying, when millions of jobs will be needed for the boys who come back, and for the boys who stayed back to make the weapons.

IMAGINEERING, you know, is the word we have coined to define what we business people have all got to do about the future; about the products we are going to make and the services we are going to be able to offer when this war is over. Imagineering is imagination plus engineering.

HOW DO YOU DO IT? One way would be to figure out, now, how to take advantage of all the aluminum that is going to be available.

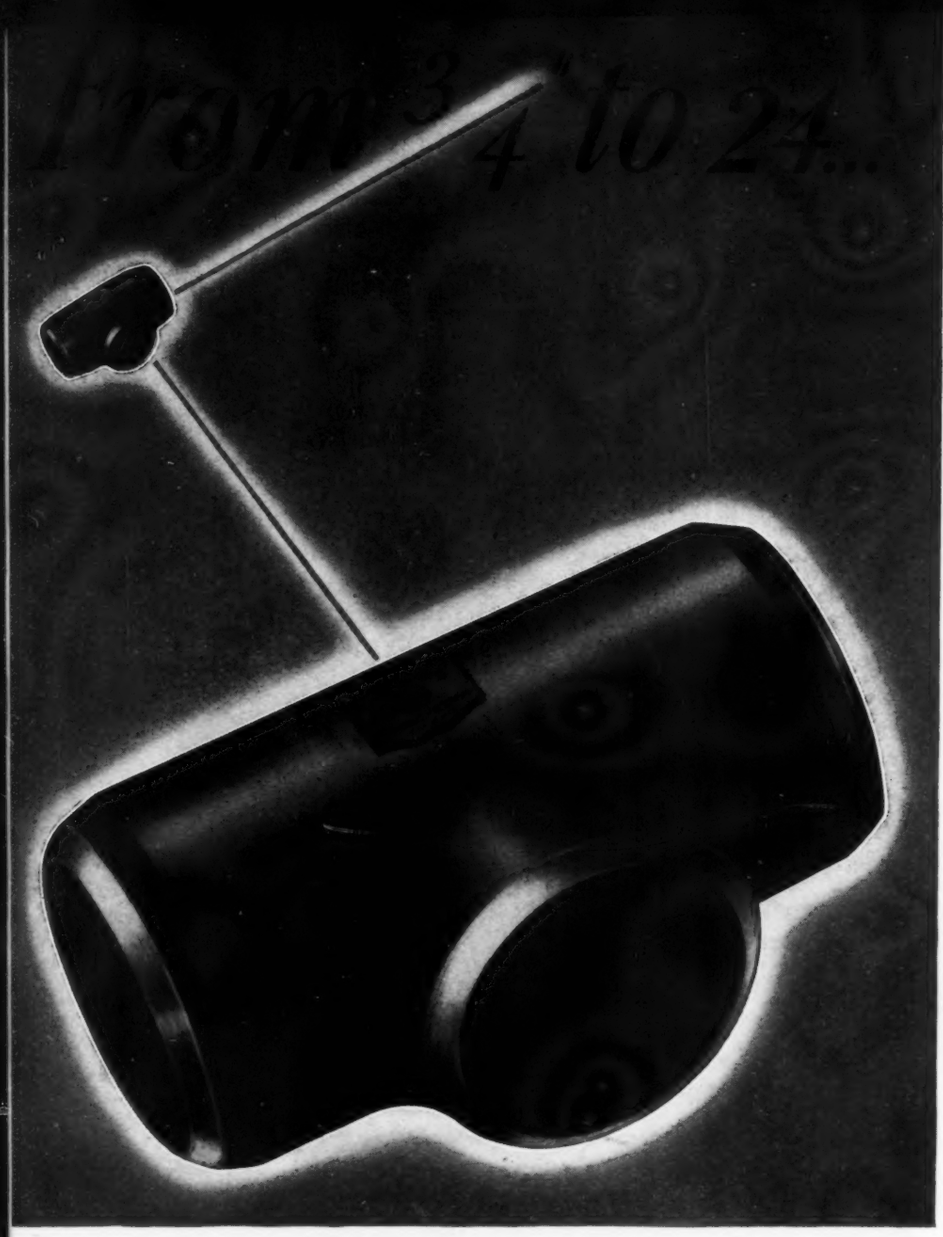
QUICKEST WAY TO GET AT IT is to take one of your products or a piece of equipment that "just couldn't" be made of aluminum, and ask yourself, Why not?

MEANING, OF COURSE, why not light; why not stronger for the same weight; why not resistant to corrosion, and so on, ad infinitum. The first man in any line of business who calls tradition a liar, and things-as-they-are a millstone, is the man who is going places; the man who is going to make peacetime pay rolls.

THAT'S IMAGINEERING AT WORK. We've got some ideas here at Alcoa. We're trying to pass them out. We are looking for men who have made themselves receptive by doing some solid Imagineering on their own hook, in their own fields.

Aluminum Company of America, 2126 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM



Grinnell Welding Fittings cut minutes-per-weld in pipe erection!

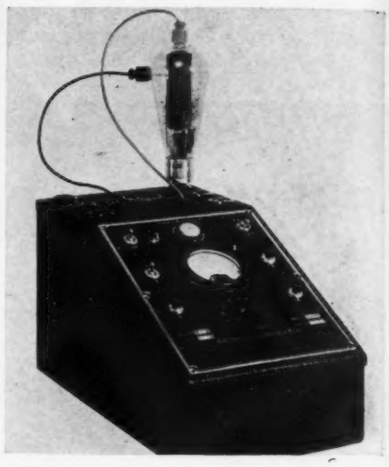
Here are stock fittings made like specialties to give quicker, better welding... to provide speedily-completed joints that pass inspection promptly and remain permanently trouble-free!

Grinnell Welding Fittings are precision engineered from start to finish. They're metal-matched with the pipe or tubing you select... identical in chemical and thermal characteristics... exactly matched in end-thickness. And their accurately extruded outlets and correctly scarfed welding faces insure quick, strong assembly of every joint by means of only simple butt welds.

Specify these better-engineered fittings to save time and trouble on your welded piping jobs. Complete specifications for all sizes from 3/4" to 24" are given in Data Book, "Grinnell Welding Fittings". Write for a copy. Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities of U. S. and Canada.

WELDING FITTINGS BY **GRINNELL**

WHENEVER **PIPING** IS INVOLVED



zontal and vertical amplitude, and focus for the oscilloscope. Operates on 110 to 120 volts, 60-cycle current. A 6-foot cord is provided. Weltronic Corporation, E. Outer Drive, Detroit.

Wrenches

Developed for use where a box wrench is needed and particularly in restricted areas, Lox-On alloy steel bolt-and-nut wrench has an inner shaft actuated by a hexagonal

handle which firmly locks the socket on the nut. Built in sizes from 1/4 to 3/4 inch, wrench enables the user to spin on or off without attention to position or need for help to hold the bolt. Available either singly or in kits of five. Patrick-McDermott Co., 2704 S. Hill St., Los Angeles, Calif.

Gasket Material

Fibrated leather gasket material with the natural advantages of leather in addition to those of a manufactured product, including quality control and uniformity, and extra-large sheets or rolls, is known as No. 841. Recommended for sealing oil, water, or gasoline, and for other general

gasketing purposes wherever temperatures do not exceed 300 deg. F. and where acids or alkalis are not encountered. Tough and tear-resistant, material is supplied in rolls and sheets in standard widths up to 48 inches, and is also available in shapes die-cut to specifications. It is compressible, has a high percentage of recovery, and takes a minimum amount of permanent set. Armstrong Cork Co., Lancaster, Pa.

Fluorescent can help speed up your production

Long recognized is the fact that better lighting permits workers to see more easily, work faster, and thus produce more. Because Westinghouse Mazda Fluorescent Lamps are so amazingly efficient, the high level lighting that increases plant output is now made economically possible.

Check the advantages of this cool, glare-free light that helps reduce mistakes and rejects, and helps speed up production. And ask your Westinghouse Mazda Lamp Distributor for details about the new, money-saving discounts on quantity lamp purchases, or write to Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, N. J.

Westinghouse

MAZDA FLUORESCENT LAMPS

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EXAMPLE

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Carter Products, Incorporated

(*Continued from page 83*)

element of the operation to the next, without pause or hesitation. He didn't hurry. Yet, as you watched him, you saw that every move counted. Just the right number of tamps on the drag of the mold; just enough mold facing; just the right amount of squeeze as he brought the cope and drag halves up to the ram. Quick, deft movements as he stripped the pattern; a touch here with his finger as he tried a mold corner; a slick there; then with sure hand he set cores into the mold, closed it and set it onto the conveyor.

"How much time?" he asked of me as he turned around.

"One ninety-seven," I replied, consulting my time study sheet.

"Pretty fair," was his comment as he started on the next one.

"One Inch Longer"

Halfway through, he stopped and beckoned me to look at the job. "See this? Just a little more draft is needed, and it won't tear up when I pull the cope. Now this corner has to have a peg stuck into the sand to hold it. If the pattern-maker had put the job into a mold one inch longer, it wouldn't have been necessary."

"Maybe it would pay to make the pattern plate bigger even now," was my comment.

"No," said Bill, "not on this job. Steve says it'll only run 500. But they should've seen that when they made it in the first place."

On the fifth mold, he had the time down to one 1.81. I told Bill and he nodded. "That's about as good as she'll do. "We don't see much of you over here, any more. How's things in the factory?" he wanted to know as he proceeded with his work.

I told him okay. Just then Al Peasely came up and we both stood watching Bill.

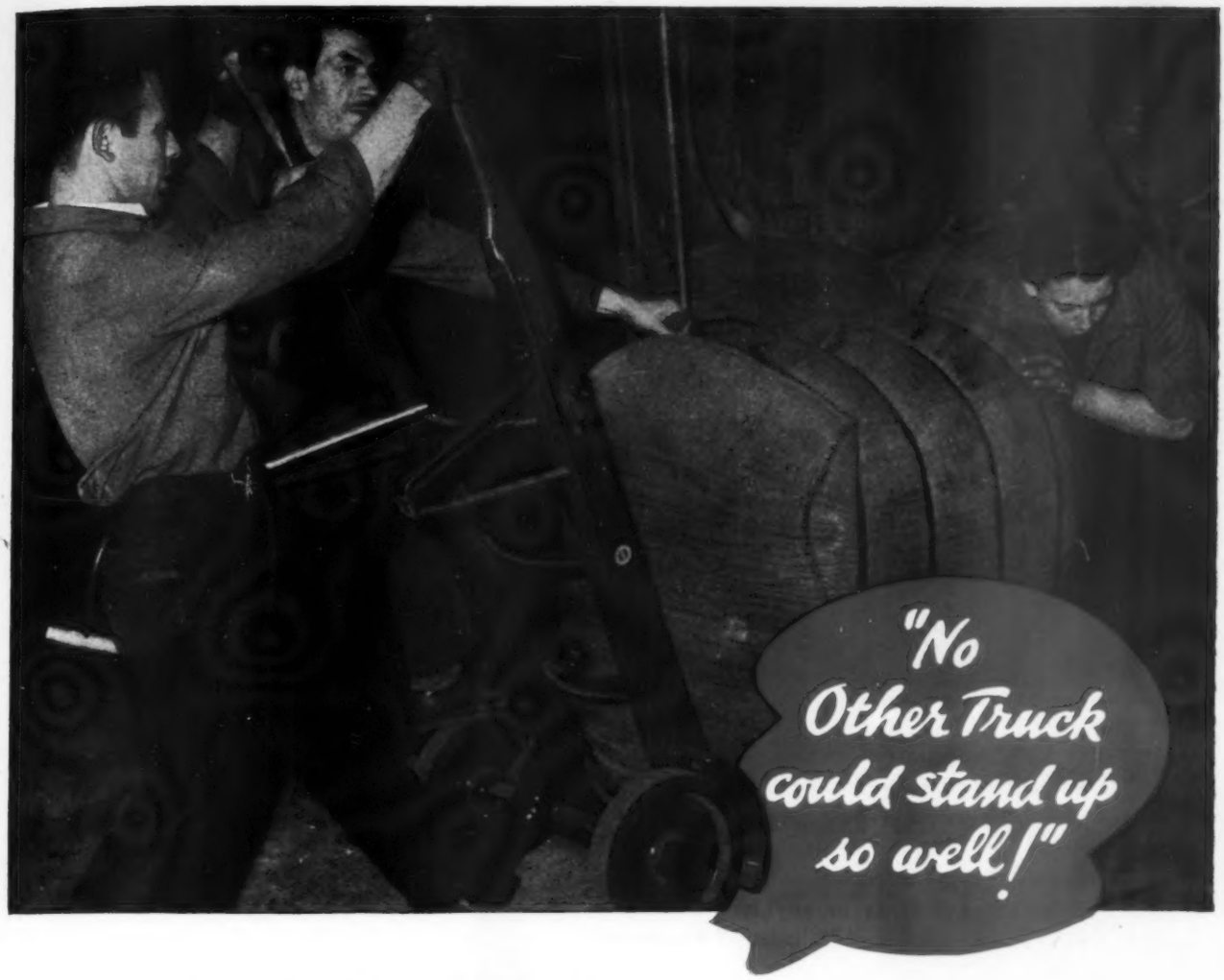
"What's the clock?" Al asked me, after the next mold was done.

When I told him, Al muttered, "Hmm. I suppose Rourke will say he ought to be allowed about 2.30. What do you think?"

I told him that 2.30 was about my idea of it.

"Let's go in and see Steve," said Al, without further comment.

We went into Steve's office. The two men never did get along very well. Steve insists upon okaying all rates set in the foundry, and often he disagrees with Al on fundamentals. At one



Murphy Storage Co., Inc., proves it pays to use AMERICAN Pressed-Steel HAND TRUCKS

Murphy Storage uses a fleet of 64" Cotton Trucks with curved cross bars. This model weighs 118 pounds. It is designed to handle bales of all kinds and is one model in a complete line of sizes and types for every hand truck requirement.

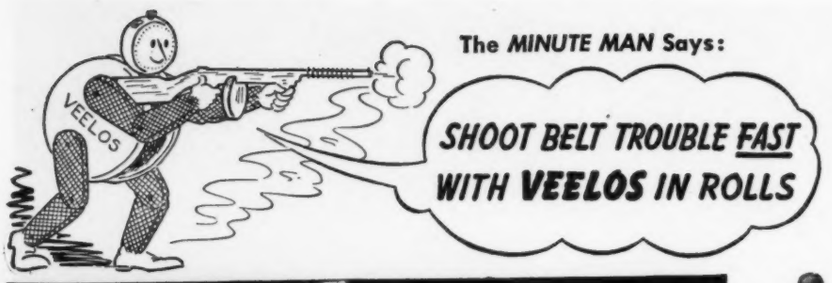
The American Pulley Company
4240 Wissahickon Ave.
Philadelphia, Pa.

All wool and 625 pounds heavy—that's the type of load handled 12 to 16 hours every day at the Murphy Wool Storage Warehouse in Lowell, Mass. And Mr. Murphy, who purchased a fleet of American Hand Trucks last year on the say-so of other users, says this of his "Americans"...

"They have required very little maintenance. It hasn't been necessary to touch them except for infrequent lubrication. They are far superior to any others we've used. Our men like them because they're balanced so well. They ride smoother, too."

In every industry, "Americans" have proved that they can do more work—with less fatigue, and important reductions in overall cost! The illustrated "American" catalog should be in your office. Write for it now!

AMERICAN
PRESSED-STEEL
HAND TRUCKS



Leading Oil Refiner* Relies on Veelos!
The oil industry cannot tolerate delays. That's why a leading refiner depends on Veelos V-Belts to drive its Diesel Generator Power Units.
*Name on request

"MINUTE MEN"—engineers and shop men in industries that can afford no loss of production time—rely on the 60-second V-Belt... Veelos in rolls. Adjustment... repair... or replacement of Veelos is quick and easy. Veelos in rolls provides an automatic supply of matched V-Belts of any length... keeps trouble away from your door! Deliveries? On-the-dot!

JOIN THE MINUTE MEN!

Shoot belt trouble fast yourself! Let a Veelos sales engineer—especially trained in power transmission work—show you how the link construction of Veelos makes it the belt to meet emergencies with lightning speed.

MANHEIM MANUFACTURING & BELTING CO., MANHEIM, PA.

VEELOS V-BELT
ADJUSTABLE to any length
ADAPTABLE to any drive

✓ CHECK!
OCTOPUS FLAT TRANSMISSION BELTING ends slippage and stretch with more powerful grip and greater resilience. Investigate!

✓✓ DOUBLE CHECK!
Plenty of KEYSTONE CANVAS STITCHED BELTING available for conveyor and elevator use! Your order delivered in a week or less!

time, years ago, Al was the time study man in the foundry and Steve was not yet its superintendent. Then Steve, as assistant superintendent, and Al mixed it quite a good deal.

"Well," asked Steve, turning to me, "did you get them?"

"I took Bill's job. There's a little touch-up work to be done on the pattern that Bill pointed out."

"What's your idea of the price on it?" asked Steve.

"He did one in 1.81." I looked sidewise at Al. "I think it's about a 2.30 job."

"Did you see it, Al? What do you think?" Steve asked.

"I don't see any 2.30 for it" said Al. "If Skebba can do 1.81 now, he'll have it down to 1.70 when the price is set."

"Maybe," commented Steve. "See any way he could cut down motions; see him doing anything that was unnecessary?"

"No," Al replied. "I'm no molder and don't claim to be. He can see things about the job that I never could. And he could put it over on us, too, for that reason."

"That's right; he could," agreed Steve. "But Bill Skebba is not the kind of man who tries to put things over."

"I've never seen a man who doesn't," answered Al, fiddling around with an umbrella and a golf ball.

"Well, you were just looking at one," Steve said. "And, furthermore, I'll bet you any amount of money that there are a dozen more like him on my molding floor. Want to bet?"

"I couldn't prove anything," stated Al, looking up from a putt he was making. "I just know how men are, that's all. They're all human and looing out for themselves."

"Hmm." Steve settled back into his chair, jiggling a pencil thoughtfully between his teeth.

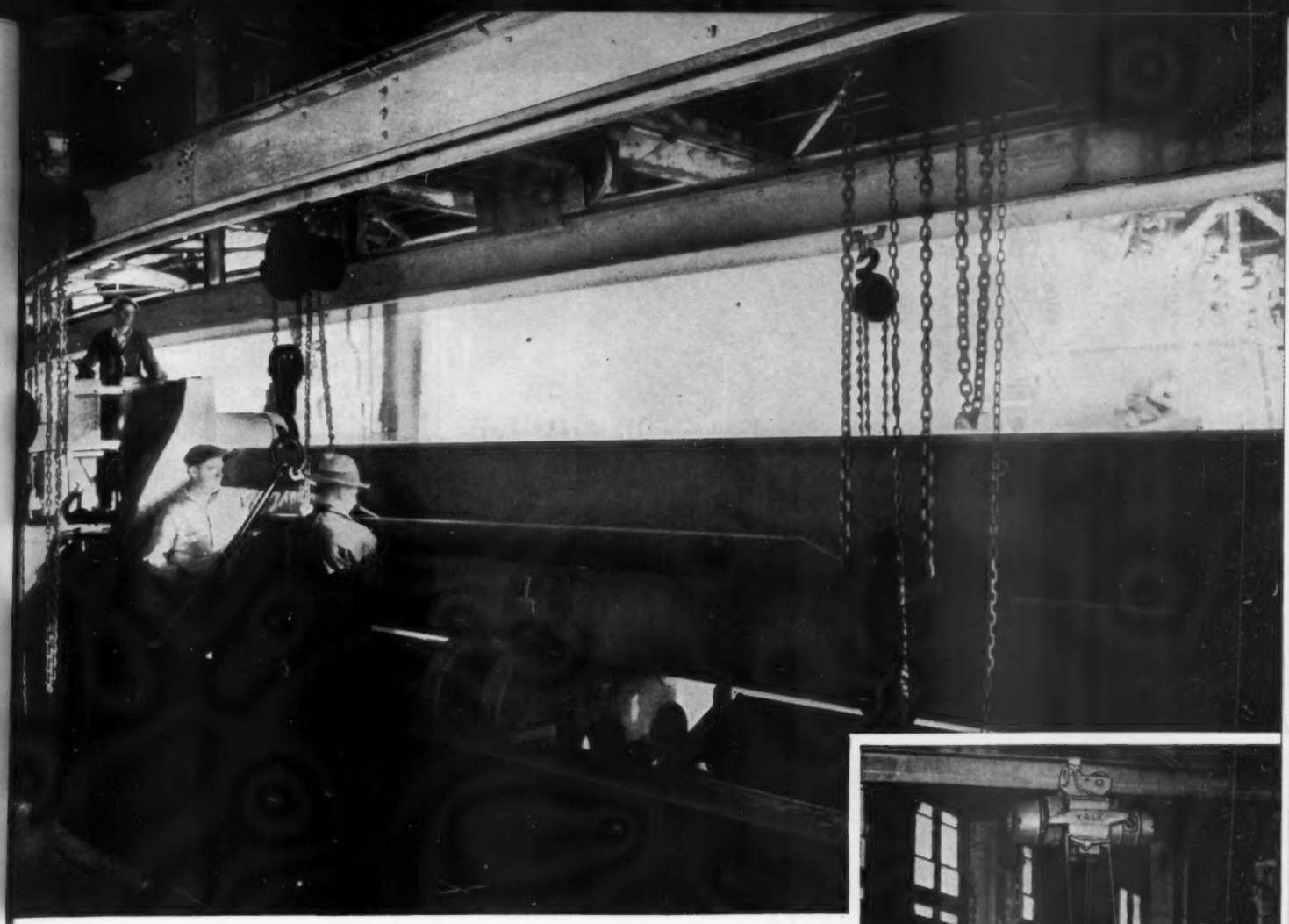
"You Don't Understand"

"Look here," Steve said. "Here's what you can't seem to understand. In a foundry like this, a lot of hard work is done in a day's time. Hard, physical labor that takes it out of a man, and sends him home at night really tired. Foundry work, or any kind of work that requires considerable manual labor, is not at all like simple machine work, or like bench assembly work."

"Yeh," agreed Al, "but these fellows get used to it, just like a foot-ball player gets used to his hard knocks."

"That's right," retorted Steve. "They do get used to it. But that doesn't take away from the fact that it is hard. You or I couldn't even begin to stand it."

"That all may be true," argued Al.



YALE HOISTS
SPEED PRODUCTION FOR INDUSTRY

To increase hoisting efficiency, help speed production, install Yale Hoists for your every hoisting job. Yale Hoists are backed by nearly 75 years of manufacturing experience, are built to last, give top performance day-in and day-out, under the most rigorous conditions.

The Ball-Bearing Spur-Geared type of Hoist (above) was originated and pioneered by Yale. It has the highest lifting efficiency ever achieved in a hand chain hoist. Among its many advantages are self-actuating load brakes, safety load hooks and friction-minimizing steel load chain.

Yale "Cable King" Wire Rope Electric Hoists (top right) are the only electric hoists to incorporate air-cooling as an integral part of their design. Air-cooling permits them to work on heavier duty cycles, since it eliminates excessive brake heat. Portable "Pul-Lift" Hand Hoists (lower right) fit in on almost any job. Inasmuch as they work in either vertical or horizontal position, they can be used for both pulling and lifting. You can't corner these hoists, either. Ratchet handle operates at any point within a complete circle.

Get in touch with your nearest Yale distributor today. Let him show you how Yale Hoists can increase the efficiency of your hoisting operations.

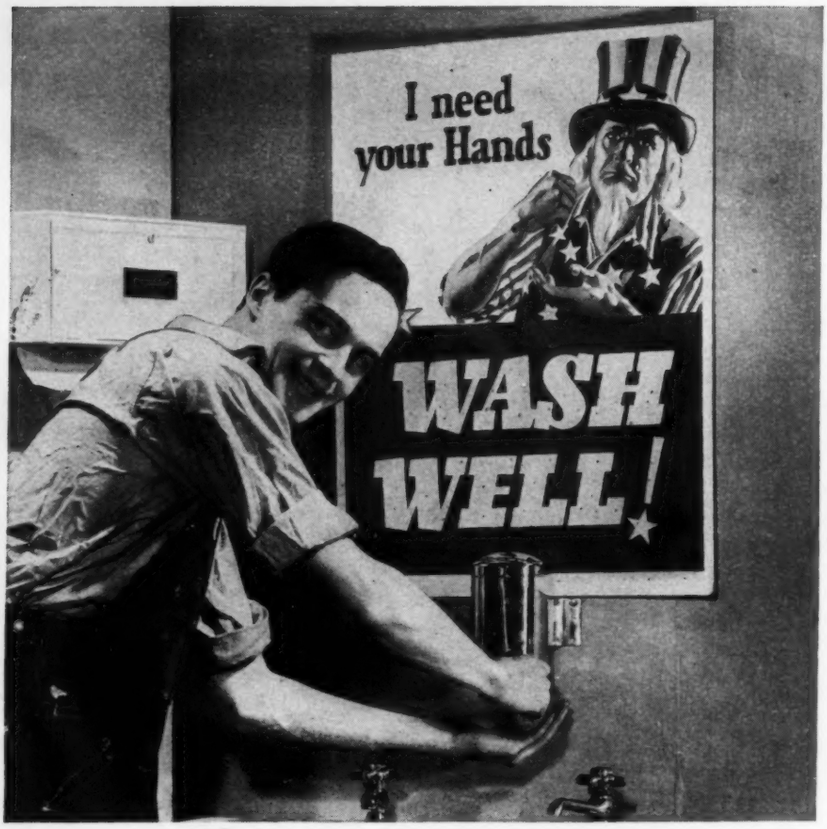
Spur-Geared Hand Chain Hoists Capacities: 300 lbs. to 40 tons. Electric Hoist Capacities: 1/4 to 10 tons. Portable "Pul-Lift" Hoist Capacities: 3/4, 1 1/2, 3, 4 1/2 and 6 tons.

THE YALE & TOWNE MANUFACTURING CO.

PHILADELPHIA DIVISION—PHILADELPHIA, PA., U. S. A. **IN CANADA: ST. CATHARINES, ONT.**

YALE

World's oldest and largest makers of Materials Handling Equipment, including Hand and Electric Hoists, Hand Lift Trucks, Electric Industrial Trucks and Tractors, Skid Platforms, and allied products.



Production pace now needs healthy hands

That's where wash-up strategy comes in. Will your men work *fast* with healthy hands or *half-work* with irritated skin or full-fledged cases of dermatitis? We've all got a war to win!

LAN-O-KLEEN* can help you keep workmen's hands healthy. A corn-meal hand soap *impregnated with lanolin,* it not only removes grime effectively but *work-conditions* the hands it cleans. That is its big *plus value.*

No parching. No invitation to chapping. Lanolin helps the skin stay moist and normally healthy. You can actually see the difference in improved flexibility of fingers no longer stiffened by toughened, taut, over-dry skin.

LAN-O-KLEEN in the washroom pays production dividends. Clip the coupon, and let us demonstrate.

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Please send me a SAMPLE QUANTITY of Lan-O-Kleen with which I will give your claim a practical test. Please include your folder explaining its use.

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"But Bill Skebba wasn't breaking his neck on that job. He could have done it much faster if he'd wanted to."

"Sure he could! But if he did, he wouldn't last. Bill Skebba is the smoothest, easiest man we've got on the floor, day in and day out. There's not another man in the whole bunch can come up to Bill's daily average."

"How about Mike Buhl?" Al asked.

"There are days when Mike can keep up with Bill and even surpass him. But sooner or later he falls back. He hasn't got the smoothness and rhythm that Bill has developed, he isn't the molder."

"That may be," said Al, undaunted. "But I still say these fellows can put it over on you if they want to."

"There isn't any job you ever timed where the operators couldn't put it over on you if they wanted to," said Steve quickly. "The thing is to play square with them and they'll play square with you. We've developed these boys' confidence in us. We've sold 'em on the idea that the company's welfare is their welfare. Otherwise, Bill wouldn't tell us when a pattern isn't right and try to help us out."

"Well, after all," remarked Al, "that's management's job, isn't it, to see that equipment is right?"

"Yes, yes, of course." Steve was evidently weary of the discussion. The subject was close to him and, to him, very simple. He stopped a moment and then went on. "It's management's job to manage. In our shop, however, management is not a distinct class. Each of our men out there feels a responsibility for what he produces. He sees it as part of all the shop produces, and therefore sees himself as an important part of the foundry. That makes him, without his realizing it, part of management, and we do all we can to keep that feeling of responsibility alive. Management isn't complete unless it operates that way. No set of desk executives—no matter what their experience—can figure things out quite as well as the men who are doing the work."

"Do you think," was Al's next remark, "that you make your men feel like part of management when you keep them on piecework?"

"I still believe," declared Steve Rourke, "that men want to be, and should be, paid for what they do Their feeling that they are part of management depends upon how you treat 'em as individuals."

"I can't see that. And, besides, our costs in the factory aren't any greater now than they were on piecework."

"You're kidding yourself, Al, on that. The operators are not working at the pace they did on piecework—"

"They got more money on piece-

DODGE VICTORY ★ WOOD SPLIT PULLEY

★DODGE OFFERS INDUSTRY THE VICTORY WOOD SPLIT PULLEY . . . TO SAVE METALS . . . TO WIN THE WAR !

STEP up your "Victory" production tempo with Dodge "Victory" Wood Split Pulleys . . . at the same time save precious metals needed for guns, tanks and other material needed to win the war. On many drives, particularly those subject to shock loads, Dodge Wood Pulleys present many inherent and structural advantages compared to those of metal.

Dodge Wood Split Pulleys absorb heavy shocks – transmit power positively without wasteful slippage. They are light in weight and low in cost . . . the tractive pull of leather on wood is greater than on metal . . . resulting in longer belt life. Interchangeable bushings provide for use of pulley on any shaft within its range of bore . . . compression fastening insures against slipping on shaft.

Many immediate and vital production drive problems can be quickly and effectively solved — without priority delays — with Dodge "Victory" Wood Split Pulleys — plus the important feature of saving precious metal for the cause of Victory.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U. S. A.

★ A Type for Every Service — Normal Duty—High Speeds — Shock Loads — Motor Pulleys

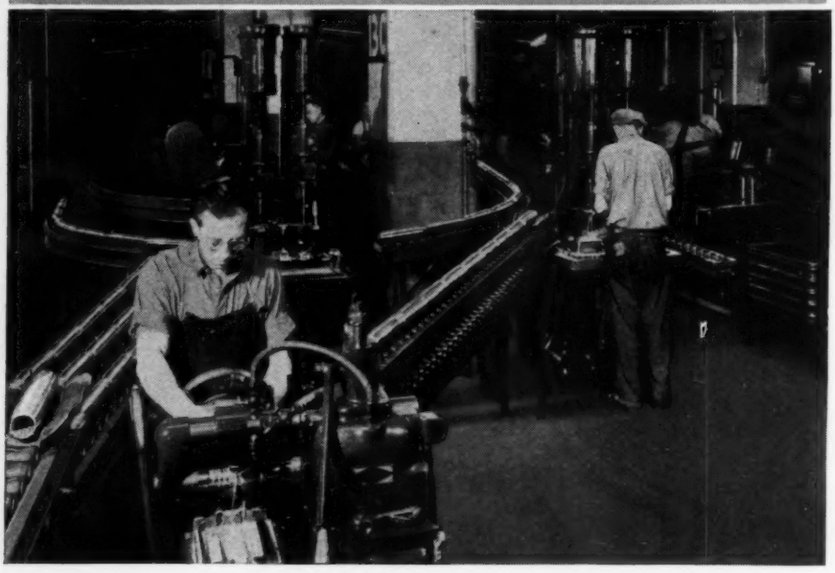
★ Standard Sizes from Local Stocks—Rush Service from Factory on Specials

★ Over Six Million Sold on One-Year Money-Back Guarantee Since 1882.

DODGE
MISHAWAKA

THE RIGHT DRIVE FOR EVERY JOB

STANDARD CONVEYORS
. . . VITAL "SUPPLY LINES" TO PRODUCTION MACHINES



CONVEYORS—planned and built by Standard—are a basic part of well organized production. They are the "arterial highways" of plant transportation—handling incoming material—work in process—keeping high-speed production machines well supplied—moving materials, parts, finished products from department to department. By cutting short handling time, eliminating repeated handling, avoiding wasteful waiting, they help to make manpower and man-hours count effectively in increased production.

Conveyorize To Meet Today's Need For Speed

Your production and handling operations can be "conveyorized" with substantial savings of space, time, and costs. Send for booklet FM-2 "Conveyors by Standard"—a useful reference book on conveying and conveyors, contains many examples of conveyor installations, shows types of conveyors best suited to various units, parts, materials, products and commodities.

STANDARD CONVEYOR COMPANY

General Offices: North St. Paul, Minn.

Sales and Engineering Offices in Principal Cities

work," broke in Al. "But costs per unit are about the same."

"Cost per unit on the same jobs you ran a couple of years ago may be the same. The hooker lies in the fact that our form of business is changing. You got decently high production on the old jobs because you had back records to prove what could be done, and the operators had no argument to put up against your production demands. But since that time, you have taken on new types of work which are gradually making past records obsolete. Lacking proof of what can be done, your arguments aren't so convincing to the operators.

"Your shop tempo is decelerating. By slow degrees, you're going back to the old days before time study was heard of.

"Why couldn't Russia pay all men the same, regardless of what each produced? People just aren't built that way and they had to find it out. Why should we in this country revert to a system Russia couldn't make work?"

Things sort of tapered off from here and pretty soon Al said he had to be getting back. Outside, Al remarked to me, "What does he know about factory costs? He's got incentives on the brain."

Maybe Al is right. But, nevertheless Rourke's foundry costs are the lowest in the state.

Wanted—Men Over 50!

(*Continued from page 77*)

looking for work?" I was asked. "Swell!" said I.

The applicant was 62 years old. He had been building and repairing pipe organs for 39 years. A blueprint was handed him, and he was questioned to learn whether or not he could read it. This was followed by a micrometer with which he was asked to "mike" several objects. He qualified.

"Would you mind doing repetitive inspection of the same kind of parts all day long?" he was asked.

"Not a bit," he replied.

"Any objection to working on one of the night shifts?"

"Not at all, but I'd prefer the 3 to 11 p.m., for then I could go fishing in my boat."

"How about the pipe organs you look after?"

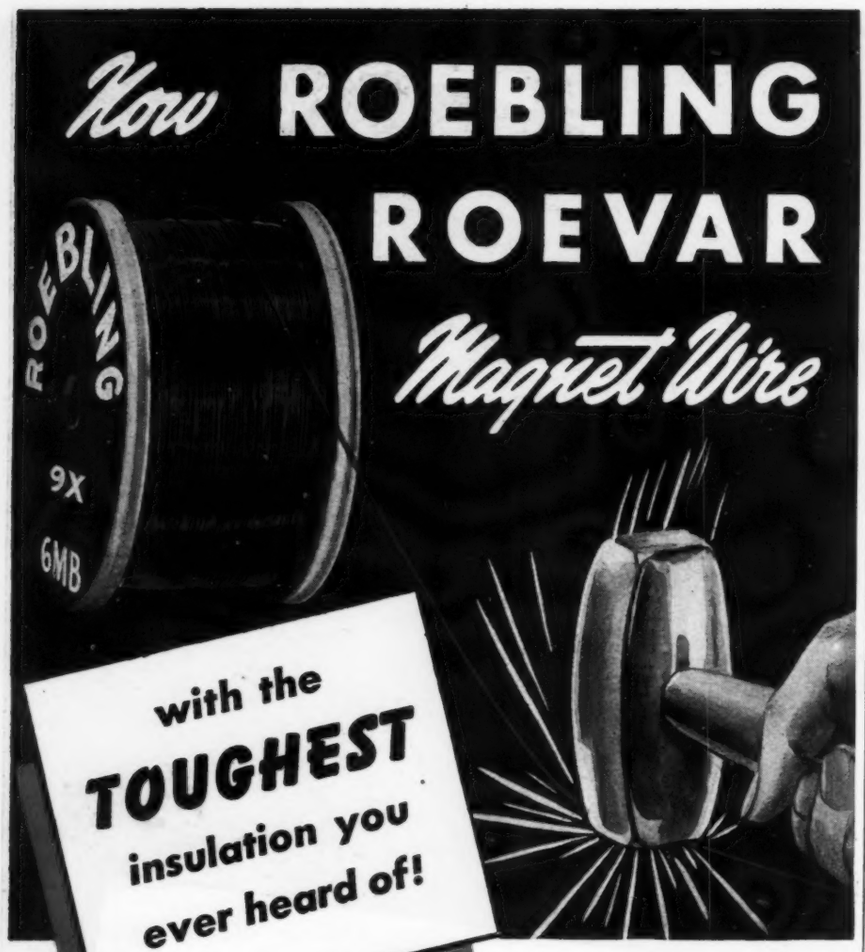
"Oh, I could find time to keep them in shape in my spare time."

He got the job.

There is something thrilling about talking to these young-old men.

Another Governor
STOPPED by
RUST!
Rust, oxidation and foaming—one or all three of these bugaboos of modern turbine lubrication can be the cause of costly shutdowns. Protect *your* turbines with Shell Turbo Oil. It is *outstanding* in all *three* ways—
SUPERIOR OXIDATION STABILITY
MINIMUM FOAMING TENDENCY
RUST PREVENTION
There's no need today to accept less. Call in Shell now!
SHELL
Keep YOUR turbines humming with
SHELL
TURBO OIL
the rust-preventive Turbine Oil

Now ROEBLING ROEVAR Magnet Wire



NEWEST OF THE BROAD LINE OF ROEBLING MAGNET WIRES!

Yes, it's a new synthetic resin insulating film — strong, flexible and tough. But you can't appreciate just *how* tough — until you've had a sample of Roevar Magnet Wire in your hand and tried it. Under actual test it proved 3 times more resistant to abrasion than ordinary enameled wire.

And, since a fabric wrap is unnecessary, it is smaller — permits the use of MORE COPPER—LESS INSULATING SPACE.

In addition, Roevar resists the solvents and high baking temperatures of treating varnishes — stands up under the abuses of modern high speed winding machines and assembly operations. That means FASTER WINDING—EASIER HANDLING—because the copper, like all Roebling Magnet Wire is "dead soft".

Made in a wide range of sizes—12 to 40 A.W.G.

*Roevar is made under license agreement with General Electric Co.

JR ROEBLING

JOHN A ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY Branches in Principal Cities

Their enthusiasm, the fun they are getting out of their jobs, the comradeship they are enjoying again with their associates—all these make a man proud and happy that he's got a job. Without exception these oldsters radiate contentment. They are an inspiration to the younger workers by whom they are surrounded. Fine workmanship and quality is all they will tolerate, but they have mellowed to the point that they can get their fellow-workers to produce it without shouting or bawling them out.

"Meet Bill Histon," said Chief Inspector Carlson. "He's 67 years old, and one of our new inspectors."

Histon had learned his trade as mechanic and toolmaker, and then spent 25 years in the real estate game. At one time during the Florida boom he was assistant sales manager of a real estate company employing 1,200 salesmen. He said the concrete floors were a little harder than real estate to walk on, but the "work" came back quickly, just like riding a bicycle.

"Why did you want to come back to work?"

"My only son is 21, and is to be drafted next Monday. I want to do whatever I can to help him by this defense work."

"Are they all that old?" I asked Carlson.

"No, come over here and meet Tom Coleman."

Tom said he was only 45 (although he looks older). After his apprenticeship as a machinist he served through the last war in the 5th Division. Was gassed twice, and hit with two pieces of shrapnel. Result: 19 months of vocational rehabilitation had turned Tom out as a draftsman (since machinists' work was considered too strenuous). Lack of work for draftsmen drove Tom into newspaper work for 14 years, and this opened up a political berth as county jailer for 4 years. He's pleased as punch to be an inspector of defense products and claims he's never felt better in his life.

Lied About His Age

The next chap we saw was Sam Bright, a naturalized Englishman, who has lived in this country for 40 years. He is 62 and is at present drawing a small pension from a gun company, where he worked for 20 years.

"I lied about my age when I applied for this job," he confided in me. "Told 'em I was only 55. But they found out when they called my last company. It didn't matter, though, and I'm having a swell time inspecting these airplane instruments. It's my type of work. Here, let me show you some of the work I did in England over 40 years ago," he said unlocking his toolbox.

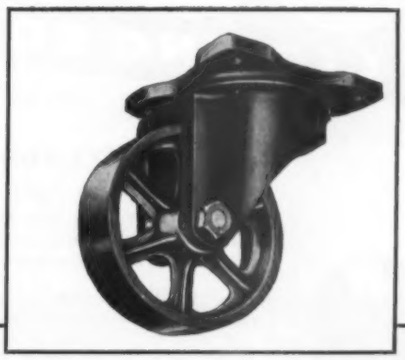
He proudly handed us several small

First of a fleet of giant four-engined flying ships being built by Vought-Sikorsky Aircraft. Note how ship rolls on Bassick Casters.

FULL SPEED AHEAD ON BASSICKS

Speed—Speed—Speed . . . on Bassicks! Wherever you turn in our mighty war-time speed-up you'll find these little wheels of industry doing their bit—rolling out goods and guns on their sure way to Victory.

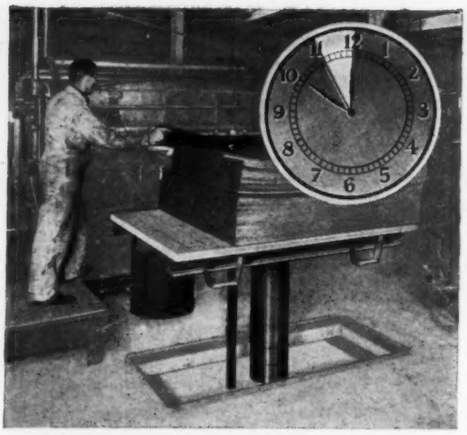
Whether you make shells or foods, motors or metals, if it's *vital*—get it going on Bassicks! Swiftly! Smoothly! Quietly! In warehouse, factory, mill and office—Bassick Casters speed your product on its way!



KEEP 'EM ROLLING ON BASSICKS

BASSICK CASTERS THE BASSICK COMPANY
BRIDGEPORT, CONNECTICUT

WORLD'S LARGEST MANUFACTURER OF CASTERS



One man now doing easily what formerly was a back-breaking job for two men. By Materialift foot control, operator keeps 3-ton load at exactly right height and with hands free to feed press.

DEFENSE PLANTS *Save Vital Minutes and Manpower*

Joyce Hydraulic Materialifts will give you faster production with fewer men. Use them for Machine Feed Tables; for Loading Platforms; for Short Lift Elevators; for Bridging Floor Levels; for Servicing and Assembling Heavy Motors. Simple to install. Powered by economical Joyce Electric Oil-Pumping Unit or an air compressor. Start and stop instantly by hand or foot control. Easily adapted to any vertical lifting job. They do away with expensive penthouse and overhead construction. Eliminate dangerous space-wasting ramps. Ideal for feed or assembly tables.

HYDRAULIC *Materialifts*

SEND FOR CATALOG NO. 600

showing seven styles of Materialifts and the many ways in which they are being used. Our engineers will submit complete plans for installation to meet your specific demands.

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LIFTING EQUIPMENT

ALL-PURPOSE JACKS

When you need Jacks, specify Joyce. There are more than 250 sizes and capacities in ratchet lever, screw and hydraulic types.

Built to lift from one to 50 tons; designed for many specialized services as well as all-purpose lifting. Ask your local Mill Supply house for Joyce Jacks, or write for Catalog No. 300.

No. 76-A
The ideal jack for general factory service. 5 to 20 tons cap.

THE JOYCE-CRIDLAND CO.
DAYTON, OHIO

★ THE STRONG RIGHT ARM OF INDUSTRY ★

blocks of steel on which individual letters of the alphabet had been cut out in relief so that the result resembled 24-point type slugs. There is no denying it—this workmanship done over 40 years ago is marvelous.

I couldn't help feeling what a shame it would be if a craftsman with his talent were to be barred from our present emergency simply because he was born 20 years before the start of this century. What possible justification could there be for utilizing the experience and knowledge of diplomats, generals, and admirals, most of whom are over 60 years of age, and many over 70, in this present war—and turning down artisans of no greater age?

"We've a score or more other old-timers who are equally interesting," said Chief Inspector Carlson, "but you don't need to talk to everyone. Their stories are much the same, a lifetime of just the experience and training we need so urgently, but they're older than most companies want today. There is one man in particular that you should see, though, and that's Ben Berrien. He's actually an inspiration to our younger men.

Over Three Score Years and Ten

Ben is 78 years old and has an infectious smile and sharp, twinkling eyes. He has been a toolmaker by trade ever since a phrenologist rubbed his fingers over Ben's head over 60 years ago and pronounced him 99 percent mechanically inclined. Interestingly enough, he was a government ordnance inspector for this district during the first World War. He also confided in us that he had during this period developed a howitzer sight to replace the British one then in use. Berrien also holds a first-class pilot's license and chief engineer's papers for the merchant marine service. He designed the first tools for half a dozen products that today are commonplace in industry. Most encouraging of all is the fact that Ben is still studying.

It would be impossible to find in a young man the wealth and breadth of practical experience in the work Berrien is doing. His associates know this.

Both Newman and Carlson are highly enthusiastic over the outstanding part their old-timers are playing in the all-out war-production effort that is being made by their company. They have found no basis for the more or less prevalent belief that "older men can't stand the increased tempo of today's manufacturing production." On the contrary, the results indicate that the added age of these men gives them a calmer perspective; enables them to remain unflurried in today's confusion, with the result that their

CLEVELAND PNEUMATIC TOOL

adds sales and service branches, expands plant capacity

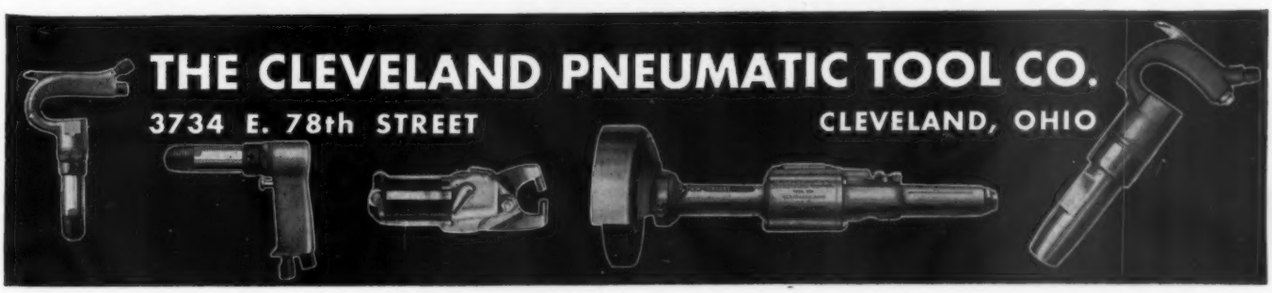
TO GIVE YOU *still better service!*

REALIZING more than 2 years ago that defense production would enormously increase the demand for pneumatic tools, we began a carefully planned program of expansion. By steadily increasing our personnel and plant capacity, Cleco Pneumatic Tool production has gone up over 300%. To facilitate our service still further, numerous branch offices have been added. As shown on the map above, our sales and service facilities are available in all parts of the country.

With all this growth, the superior quality of Cleco Tools has been carefully maintained. Today, Cleco Chippers, Riveters, Sand Rammers, Drills and Grinders, have the same outstanding reputation that has made them famous for over 40 years.

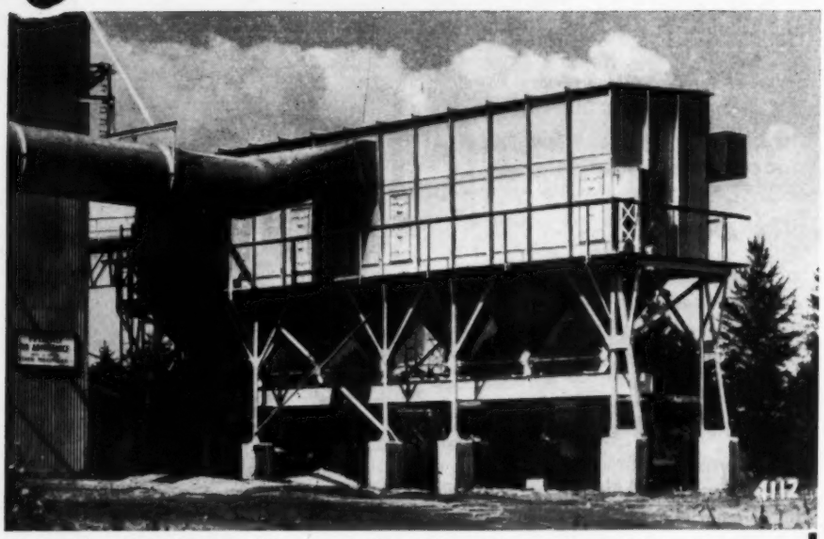
Now that war is upon us, and the nation cries for production and still more production, you can count on Cleveland Pneumatic for fast, thorough service in meeting your tool requirements.

Write for complete information on Cleco Pneumatic Tools



• An Aid to Greater Production

SLY DUST CONTROL



Sly Dust Control at the Staso Milling Co., Pembine, Wis., producers of granulated roofing stone.

IN these days of high-speed production, Sly Dust Filters are of vital aid in making cleaner plants, helping maintain quality of product, saving maintenance costs, and protecting health and safety of employees.

Exclusive advantages in Sly Dust Filters:

(1) Greater filtering capacity because of more filtering cloth.

(2) Taut bags at all times, saving power and resulting in quicker removal of dust.

(3) Bags more easily replaced.

(4) Automatic control (any degree) minimizing or removing the human factor.

(5) Simpler shaker mechanism resulting in savings in maintenance and operation.

Whatever your dust problem, write us. Sly engineers are experienced with all kinds of industrial dusts. We shall be glad to tell you what advantages you, too, can realize, and give you full particulars.

THE W. W. SLY MANUFACTURING CO.

Branch Offices in Principal Cities

4755 Train Avenue **Cleveland, Ohio**

SLY
INDUSTRIAL DUST CONTROL

actions and decisions are more mature and dependable.

Bill's philosophy in the matter is something like this:

"Two and two may make four in every other phase of our business, but not necessarily with our personnel. You can't solve personnel problems by arithmetic. Unless they are seen as living, dynamic history, they are very liable to be bungled. The firm that hangs a 'No Help Wanted' sign out for the man over 50 to 60 years of age, and then howls about the scarcity of skilled help, is just asleep at the switch."

Time Now for Brass Tacks in Employee Relations

(*Continued from page* 85)

long-term strategy which has been evolved by the country's most experienced and expert negotiators. Almost by the bushel, these local committee men and stewards are receiving leaflets telling them just how to proceed, step by step, towards final, big-scale achievement of their "mission."

One reason, incidentally, why many of the largest concerns that long refused to take the closed shop menace seriously have lately awakened to find themselves encircled by a ring of closed shop suppliers, is that these smaller employers failed to observe that their harmless-looking, small-town committee men were working under campaigners who had adopted Hitler's program of "first undermine, then attack," and "take 'em one at a time!"

Another reason is that these same committee men have long been causing work stoppages on orders from their International bosses. Such stoppages served to make the closed shop's promise of "uninterrupted operation" look good. In addition, they kept the company's personnel department so busy putting out departmental or branch-plant fires that it could hardly bother about preventing them by securing the understanding and confidence of its rank-and-file workers.

Those office hoss-tradings have been made difficult enough now that the international officers thus regularly figure as powerful though unseen participants. Still greater difficulty results from the fact that, alongside those unseen international officers, stand now the still more powerful though equally unseen representatives of politics and government. Let one wrong word or one unsatisfactory decision be uttered and, presto, the local hoss-trade becomes a national issue for Washington's attention. There, alas, the final decision has too often

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● Our preparedness program requires that the machine tools, electric motors, and other machinery in every defense industry be kept in the best of condition.

We at Bunting are cooperating by maintaining adequate stocks of Standardized Bronze Bearings and Bearing Bar material in hundreds of sizes at BUNTING warehouses and wholesalers in all principal cities.

BUNTING Bearings are completely finished to fit applications in machine tools, electric motors, and many types of industrial equipment.

Ask your wholesaler. Write for catalog today. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

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PRECISION BRONZE BARS
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If it's about bearings or bearing metals, you'll find what you want to know in this big BUNTING Catalog.

CM "INSWELL"
STEEL CHAIN

Industry rightfully depends on its greater strength, safety and long wear

CM "Inswell" Electric Welded Steel Chain is not ordinary chain . . . it's as different as day and night!

The patented "Inswell" electric weld process puts extra metal, for extra strength and safety at the critical point of each link . . . at the weld. Too, "Inswell" welds are at the side, with the extra metal inside. This "Inswell" feature contributes to faster handling and freedom from "kinking".

Formed from a special analysis steel, every link of *CM* "Inswell" Electric Welded Steel Chain is uniform in strength, size, durability and elastic limit . . . is carefully tested to well beyond safe working loads.

For the extra service-time demanded by today's production needs, specify *CM* "Inswell" Electric Welded Steel Chain. There is a size and type for every industrial application.

Call your mill supply distributor for full details, or write for descriptive bulletin.

COLUMBUS-McKINNON *Chain* CORPORATION

(Affiliated with Chisholm-Moore Hoist Corporation)

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in pre-Pearl Harbor days been based less upon the long-term well-being of the persons originally involved than on the "face" and standing of a federal board or the necessities of the next country-wide election.

So not only have employee relations been crowded into a mere negotiating compartment, but that compartment has also been made the scene of a one-sided and depressing set-up.

"In this corner, ladies and gentlemen," so might run the announcement of these office debates, "we have for our main bout the long-honored but somewhat inexperienced lightweight known familiarly as Kid Employer. In the same corner, now that the ring has lately been reduced, we have the young featherweight popularly—and I might add, carelessly—known as Boy Committee Man. As his able though invisible coadjutor, I have the honor of presenting the internationally trained welterweight carrying the title of Headquarters Harry. Along with these two, you will observe if you have good eyes, the famous heavyweight called by some Political Pete and by others Federal Bill."

Of such a bout as staged not long ago in France, history has recorded the outcome. Begun in '36 when Premier Blum forced political relations into every plant-office meeting in the place of industrial relations, it ended when Hitler scratched out "political" and inserted "military."

Especially now that the President has sidestepped the question of closed shop, it is perhaps silly to hope that the same ring corner here can, even under the stress of all-out, crucial war, be made fairer by a national labor policy less one-sided than the present one of day-to-day political expediency. In that case, it may be that our employers have no choice but to organize their own unions in order to secure for the benefit of every local office dicker, and hence of national production, the services of their own ablest long-term, super-strategists.

As stated in FACTORY of February, 1941, I believe such unionization of employers and such nationalization of agreements are sure to intensify class lines and so to inflict permanent hurt on manager, man, and country. But if, year after year, government insists on being not only an invisible but also an unfair attendant whenever manager meets committee, then perhaps there is no alternative.

Nevertheless, there is still some ray of hope to be found in the words given me in 1938 by a conservative leader of France's coal miners:

"What we need, if our country is to be saved, is to throw national pol-

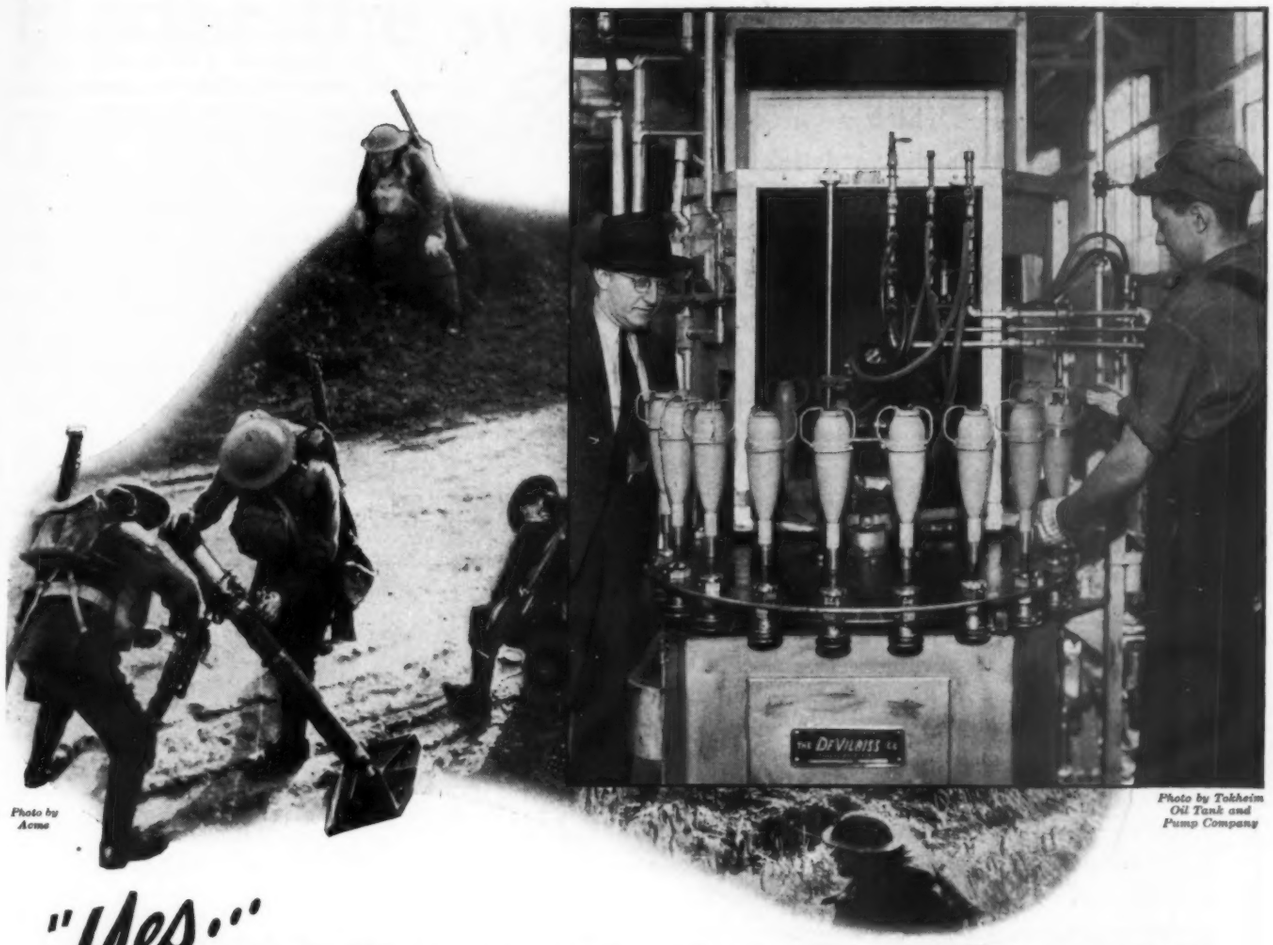

Photo by Acme

Photo by Tokheim Oil Tank and Pump Company

"Yes..." PAINTING 'EGGS' IS DEFENSE WORK"

● Painting eggs doesn't sound like a defense job. But "eggs" is Army lingo for the high-explosive ten pound bombs that are hurled from 3-inch trench mortars. Tokheim Oil Tank and Pump Company of Ft. Wayne, Indiana, is turning them out at the rate of many thousands a day, on British and U. S. Army orders.

Painting these "eggs" is an intricate and exacting task. And Tokheim, which for many years has used DeVilbiss Spray Equipment to give its well-known oil and gasoline pumps their attractive enamel finish, again relies on DeVilbiss for the answer.

It has installed three specially designed DeVilbiss Automatic Systems, one of which paints each bomb casing inside and out, while a second coats primer cup assemblies, and the third sprays tail fin units—keeping up with top speed continuous three-shifts-a-day production.

Tokheim's story is typical of the way modern DeVilbiss Equipment is helping industry to solve new finishing problems in the transition from peacetime output to defense manufacturing. Helping to make America the arsenal of democracy. If your company is taking any part in that tremendous job, DeVilbiss Spray Systems can aid you to do it faster and better.

THE DEVILBISS COMPANY • TOLEDO, OHIO

Canadian Plant: WINDSOR, ONTARIO

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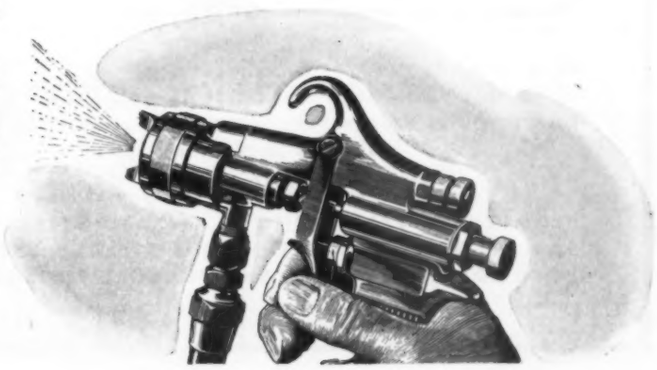
THE COMPLETE DEVILBISS LINE CONSISTS OF: Spray finishing equipment • Automatic coating machines • Tanks for spray materials • Spray booths and exhaust fans for vapor and dust elimination • Air regulators, cleaners and dusters • Air compressors • Respirators • Specialized hose for paint, air, water, gasoline, welding and pneumatic tools • Hose connections • Water and oil guns • Equipment to prevent offset in printing • Paint stripers • Medicinal atomizers • Perfume atomizers.



DEVILBISS
SPRAY SYSTEMS

. . . it will be a hard war. That is the basis on which we now lay all our plans. That is the yardstick by which we measure what we shall need and demand . . . money, materials, *doubled and quadrupled production—ever increasing* . . .

from President Roosevelt's Address
Tuesday, December 9th, 1941

Need Help to Hit This New Tempo?

Multiplied production means multiplied problems—with less time for experimenting. Why not answer your steel puzzles *faster* with Frasse Technical Service?

Production bothering you? Let Frasse engineers help you find a better steel or speedier method! Blocked by shipping "promises"? Let Frasse Technical Service try to find you an easier-to-get substitute! Priorities? You needn't be confused — Frasse can give you up-to-the-minute information at once!

If it's reference data you need, Frasse can provide it aplenty—calculators to simplify heat treatment, fabricating and design handbooks, and a *new* data chart file specially designed for mechanical steel users. (The latest addition shows a short cut system for figuring tubing weights. It's yours for the asking.)

Whatever your steel problem, Frasse engineers will help you unravel it faster. They're competent (the letter below is one of scores open to inspection)—and their services are "on us". *Call Peter A. Frasse and Co., Inc., 17 Grand Street, N. Y. C. (Walker 5-2200) • 3921 Wissahickon Avenue, Philadelphia (Radcliff 7100) — (Park 5541) • 50 Exchange Street, Buffalo (Washington 2000) Jersey City, Hartford, Rochester, Syracuse, Baltimore.*

"Some letters are unpleasant and some are very pleasant to write. It is a pleasure to write this and to thank you for your efficient service and your complete cooperation in getting us out of our machining difficulties.

Frankly, if your Mr. Van Horn had not come down, we would have had to turn down a fairly good sized contract in conjunction with the Defense program."

Sincerely yours, W. K. Slatford

JOHN CHATILLON & SONS, W. K. SLATFORD, *Purchasing Agent*

FRASSE STEELS

Frasse Technical Service

TO AID YOU IN PROCUREMENT, DESIGN, AND PRODUCTION PROBLEMS INVOLVING MECHANICAL STEELS

Frasse Mechanical Steels

SEAMLESS STEEL TUBING • WELDED STEEL TUBING
SAE ALLOY STEELS • STAINLESS STEELS • DRILL ROD
COLD ROLLED STRIP AND SHEETS • COLD FINISHED BARS

itics out of our mines and factories and put industrial relations back in."

Or, to phrase it differently, put in the corner alongside the overmatched employer a certain champion known as Public Opinion.

"You'll observe, ladies and gentlemen, that this participant appears a shade ponderous and slow. But don't fail to keep your eye peeled for one of his up-from-the-floor hay-makers!"

As a matter of fact, this heaviest of all heavyweights is pretty surely in the ring already. Whatever may be the policy of the newly proposed Labor Board, this champion will hardly fail to force quick congressional action the moment too many unions appear, in spite of those Pearl Harbor bombs, to put their own above their country's security. It is to be hoped that, without waiting for the lawmakers, labor leaders both local and national will now begin to evidence responsibility equal to their power. But, whether they do or don't, the patriotic manager will manifest in both office and on the working floor the utmost of leadership calculated to allay his employees' uncertainties and fears, and unify and ennoble their fullest "how-can-I-help?" aspirations.

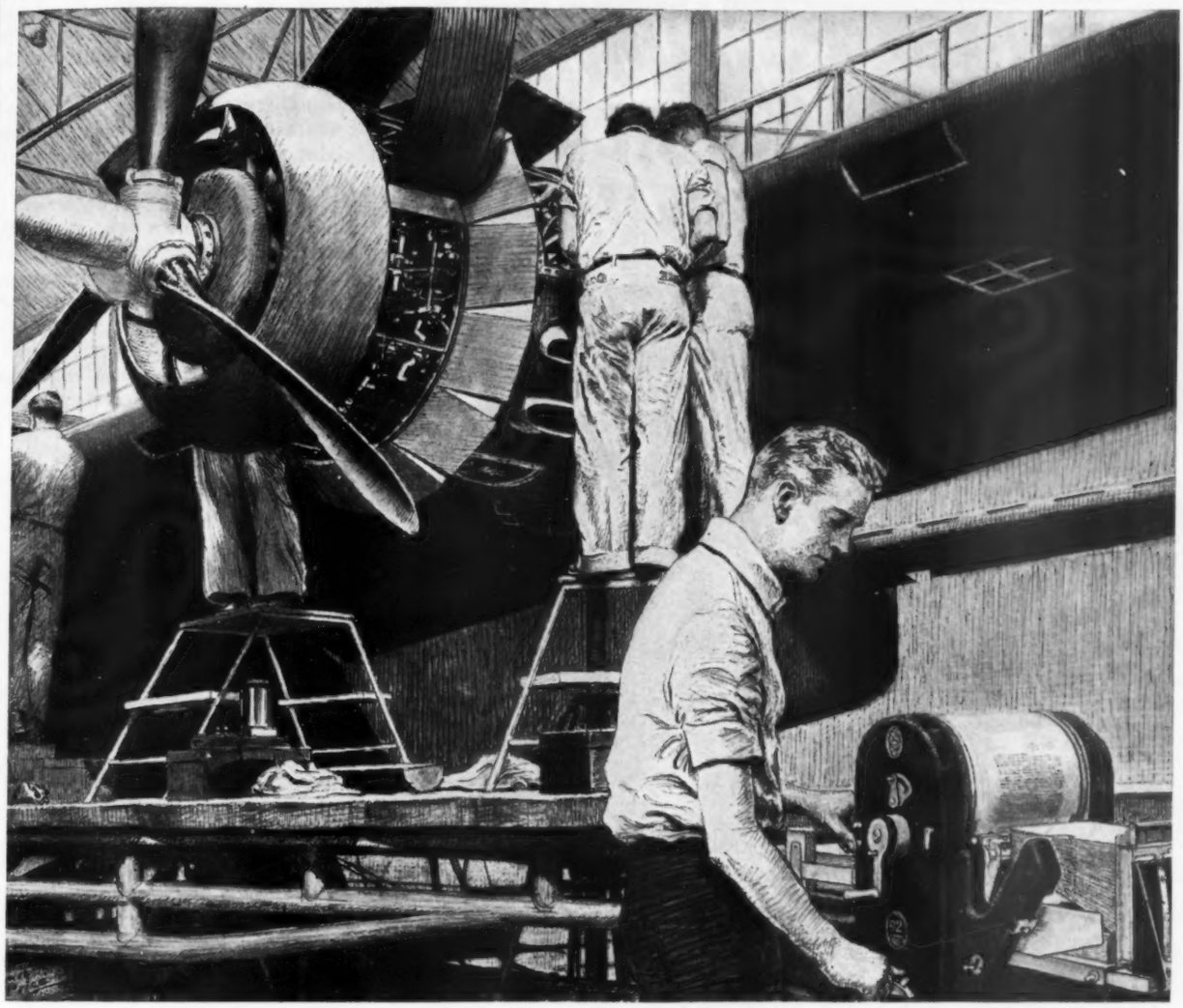
Straws in the Wind

Already many signs of this effort—without unfriendliness to collective bargaining—are evident. Thus, one head of a large plant has lately instituted what he calls "Informative Meetings." He and his associates name persons from the various departments for discussing together at regular intervals, with questions and answers, all sorts of items affecting both the workers and their families—the company's and every department's role in the winning of the war, its prospects for steady operation, new models or processes, procedures in the case of blackouts, plans for home-front activities, etc. If any item is thought to veer too closely towards wages or working conditions, it is quickly shunted off for handling by the regular union arrangements.

Others could be named who find it useful to set up such arrangements for explanation as they never dreamed of before. For example, if one assembly line must be sent home for reasons that do not affect other lines, the gang bosses who break the news to their workers give also the specific reason. Still others there are who now take more pains that ever before to exhibit and explain the final war uses of products now being made on subcontracts, in addition, in some cases, to reporting the success of the fire-baptism undergone by these products on the fighting fronts.

The number is growing, also, of

Under the wings of production



"Bomber Production Line," (Consolidated Aircraft Corp., San Diego), a drawing by Norman Price

It takes 30,000 parts to build a bomber—not counting rivets, nuts and bolts actually by the million . . . These 30,000 parts are built into 650 units . . . and these 650 units become 32 sub-assemblies—wing, fuselage, tail surfaces, rudders.

As the production lines roll, those parts, units and assemblies must move . . . must travel through fabrication to final assembly inspection in exact order and sequence.

Controls that keep lines rolling . . . that keep those parts arriving in the right place at the right time . . . are thousands of tags, called *"tote tickets."* Producing *"tote tickets"*—to guide the whole system and keep it running smoothly—is the responsibility placed upon the Mimeograph duplicator and supplies.

Mimeograph equipment frees executives and employees alike from the burdens of paper work, thereby increases their productive time. It reduces chances for error, cuts losses caused by waste and inefficiency. It helps gear up industry to meet the needs of a geared-up America.

To get the benefits of Mimeograph duplication for your company, call the Mimeograph distributor in your community—or write A. B. Dick Company, Chicago.

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Mimeograph duplicator

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ALVEY-FERGUSON CONVEYORS NOW *KEEP 'EM MOVING* IN AN "ENDLESS STREAM"!

TO SCIENTIFICALLY PLAN and build endless stream conveyors for arsenals and factories producing war materials is a fairly simple job for Alvey-Ferguson.

With 41 years of experience in designing and manufacturing efficient materials handling and products handling systems this is not our first war production experience.

Anticipating a greater need for conveying equipment, we started a big expansion program months ago. The first unit in this program, recently completed, has increased our production capacity 25%.

For a discussion of your problems, or for either of our two new illustrated catalogs featuring A-F Scientifically Planned Conveyors and Super-Spray Product Washing Machines—write without obligation, today.

THE ALVEY-FERGUSON CO.
122 Disney St. CINCINNATI, OHIO

•Photo courtesy Herald-Tribune, Joliet, Ill.

CONVEYING A-F MACHINERY

ALVEY-FERGUSON *Conveyors*
AND PRODUCT WASHING MACHINES

executives who now have courage to discuss their war objectives, war problems, and war results on the bulletin board, in the plant paper, or in shop-wide meetings. Also of those who set aside afternoons each week, not for being simply in the plant but for carrying there a relaxed expression, a sympathetic ear, and a friendly tongue for inviting worker query or complaint, or for passing on the word of praise or reassurance.

Other managers, lucky enough to have personnel men who enjoy the confidence of the rank-and-filers, are seeing to it that these officers are given enough freedom from their desks to make easy for everyone the voicing of his inmost fears or hopes.

One certain personnel man who lately has inducted many new employees, has installed his associates in branch offices out on the working floor. There, in easy access to all, they are instructed when any need of any sort is voiced, to move and move fast.

All this is being made easier by the surprising and gratifying way the workers in some plants, often with the cooperation of their committees, are asking whether they can contribute to the purchase and presentation of tanks, planes, and what-not, or are flooding the management with suggestions for increasing output.

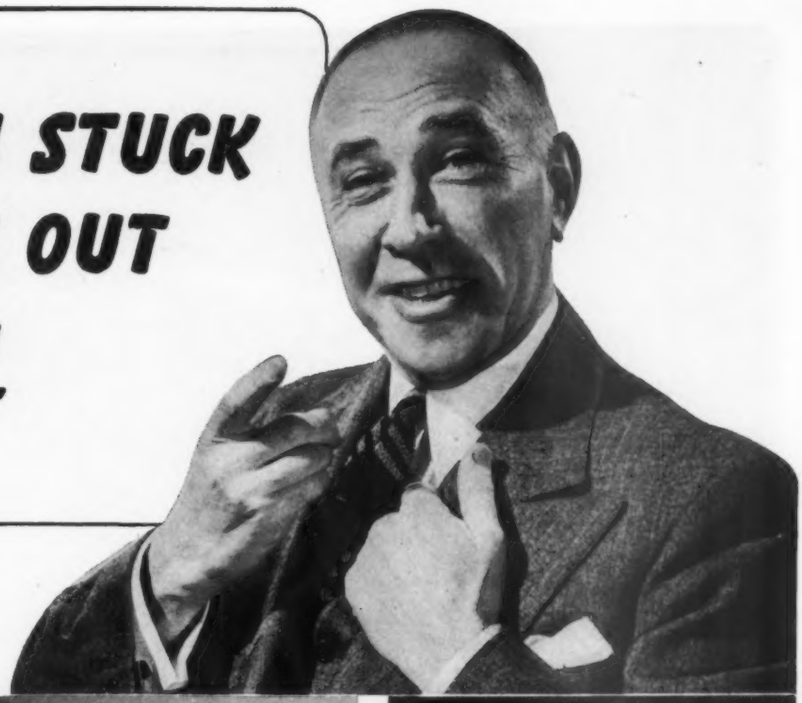
None of the above need represent effort to invade or weaken the rights given the worker by federal laws or to lessen the union security they prescribed. But these laws hardly intended that union committee men should henceforth take over the full leadership of the productive establishment. Even if he wished it, the manager cannot possibly escape that responsibility for worker leadership which is inseparable from his now crucial responsibility for production—a responsibility met only when both manager and man have shown their ability to accomplish, together, their utmost—and, even beyond that, the impossible.

Conceivably, nothing less than Pearl Harbor bombs could have blown open for the manager this present barn-door opportunity to demonstrate his worthiness to enjoy again on behalf of his country that respect and leadership of which he was so regrettably deprived by the depression.

In speaking of "the passing" of hoss-trading mediation boards, John Lewis was probably too optimistic. But, at any rate, our precious freedoms will be preserved and those treacherous Jap bombs properly avenged only if their explosion is helped to shock us into both a purification of the hoss-tradings in the office and a revival of sound and wholesome human relations in the plant.

"I'M GLAD I STUCK MY NECK OUT

AND TURNED DOWN THOSE LOWER BIDS"



No. 4—*An Actual Experience from the sales records of* COMBUSTION ENGINEERING CO., INC.

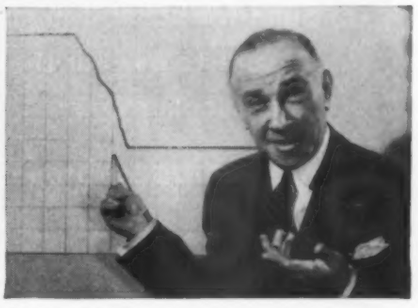
1. This executive of a large paper mill, faced with the need of replacing his steam generating equipment in 1937, included C-E among the boiler manufacturers who were asked for quotations on a new installation.

2. In a preliminary discussion, the C-E Salesman finds the customer calculating the savings to be gained by fitting the new boilers into existing space and by utilizing attractively-priced fuel-handling equipment.

3. Despite this emphasis on minimum investment, C-E Engineers first adopt an investigating approach. They soon discover that the plant's existing equipment requires selected coals selling at a premium price.

4. A geographic survey of all local coals reveals that low grade screenings are available at a much lower price. So C-E designs a unit that takes advantage of lower operating costs for greater long-term economy.

5. The result is a proposal that's "out of line" with the price of alternative designs. But the customer sees the greater future savings due to this fundamental analysis of his problem. He gives the contract to C-E.



6. After three years' operation, the customer now *knows* the advantages of the C-E recommendation. He can point to operating costs that have been *cut in half* because he took a long range view of higher first cost.

This actual case history is only one example of a steam generating problem solved by C-E. In this instance the answer was a more expensive installation that proved to be the more economical in the long run. By contrast, C-E is frequently able to point out economies that reduce first cost, too, in addition to providing an installation that proves to be economical through years of operation. The point that merits the consideration of any executive who influences the selection of steam generating equipment is that C-E has the experience and skill required to determine the ideal answer to his particular problem.

World's Most Complete Line of Steam Generating and Related Equipment for all Industrial Service

C-E

BOILERS • STOKERS • PULVERIZED FUEL SYSTEMS
FURNACES • STEAM GENERATING UNITS
SUPERHEATERS • AIR HEATERS • ECONOMIZERS
DRYING AND INCINERATION SYSTEMS
• CHEMICAL RECOVERY UNITS •

COMBUSTION ENGINEERING COMPANY, INC. 200 MADISON AVE. NEW YORK, N. Y.

A-636

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Shells
FLYING TOO!
Forging lubricants containing "dag" colloidal graphite are helping to set new records in the production of shells . . . "Dag" colloidal graphite increases die and mandrel life, reduces sticking and improves the finish. Send for bulletin number 130V and be sure to ask for the name of your local supplier. . . . . .
"dag" is a registered trade-mark of Acheson Colloids Corporation.
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Port Huron, - - - Michigan
The electric-furnace graphite in "dag" products is made in the U. S. A.
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REG. U.S. PAT. OFF.
COLLOIDAL PRODUCTS

To Industry: "Dag" Colloidal Graphite is a lubricant – resists extreme temperatures and pressures – is electrically conductive, opaque and chemically inert – can be suspended in many liquids including the lighter viscosity fluids.

Conveyorized Plant Finishes Shells

(*Continued from page 81*)

guns are installed at each spray station, and the ovens, because of the slower conveyor speed, are only 19 feet long.

The booths on Line No. 2 machines are larger than those on Line No. 1 machines, because six guns instead of four are installed at each spray station. Therefore, larger fan motors were installed to provide the desired exhaust velocity of 250 lineal feet per minute.

Beside each hand-spray booth is an oven similar in design to the driers on the automatic machines. The exhaust air from the booths is cleaned in elevated nozzle-type water washers and is pulled through the booth openings at a speed of 150 lineal feet per minute. This lower exhaust rate is sufficient, for only two guns are used in each booth, the frontal opening of which is several times the area of that of each machine booth.

Bombs move through each booth on sawhorse-like workholders attached to rectangular bases, which slide along on roller conveyors, and are sprayed by two operators. The spray equipment at each booth consists of two production-type spray guns, two air transformers which clean the compressed air and regulate its pressure, two gun hangers, several lengths of air and fluid hose, and all the necessary fittings, valves, etc.

On Line No. 3, three water-wash spray booths and oven assemblies—identical (except for the size of side work openings) to those used for hand spraying on Line No. 2—are employed.

Another line, designated as 3-A, to paint and load the same sizes of bombs that are handled on Line No. 3, is now under construction. In this building will be installed two water-wash booths with hand-spray equipment identical in all respects to that used on Line No. 3.

Separate single-line paint-circulating systems for each load line have been installed to carry the lacquer enamel to all automatic and manual spray stations. Mixing rooms for each system are housed in fireproof inclosures located apart from the areas in which painting takes place. Four 120-gal. mixing tanks with electrically driven agitators and two pumps—so connected that material from any or all tanks can be circulated by either or both pumps—comprise (with the pipe loops, fluid pressure regulators,

WHETHER YOU ARE

Wiring OR Rewiring

Typical installation of Wiremold for lighting and utility circuits in an industrial building.

● There are many advantages in having your wiring circuits ON THE SURFACE. Wiremold Surface Metal Raceway Systems can be extended or relocated quickly, at low cost. New circuits can be added or changes made in the location of outlets, switches, etc. without breaking into plaster or "fishing" old conduits.

Furthermore, wiring that is enclosed in strong, safe Wiremold Surface Metal Raceways is always readily inspectable, less subject to unnoticed deterioration, completely protected. Wiremold Raceways meet all Code and Underwriters' requirements yet their compact, thin wall construction conserves steel.

These are some of the reasons why architects, electrical contractors and plant or building managers now favor Wiremold Wiring Systems for initial wiring installations in new factory, school, office, and commercial buildings. Wiring or re-wiring, Wiremold does a better job in the first place and lays the foundation for further economies through the years.

Catalog and Wiring Guide on request.

SAVE TIME . . .

CONSERVE MATERIALS . . .

DO THE JOB FASTER . . .

with **WIREMOLD**

SURFACE METAL RACEWAY WIRING SYSTEMS

THE WIREMOLD COMPANY
HARTFORD, CONN.

SEE OUR CATALOG IN SWEET'S

BETTER LIGHTING must start with BETTER WIRING

and accessory equipment) each system. Thus each hook-up is actually a double system, and half can be held in reserve as a standby.

All spray booths on all load lines—for both automatic and hand spraying—have vapor-proof lighting fixtures which brilliantly illuminate the spraying operations.

The plant is light, airy, spacious, and immaculately clean. It employs color freely with the result that the employees have the benefit of a bright and cheerful atmosphere while at work. And, equally important, the color is employed as an identification system to denote function—a real contribution to the plant's efficiency.

All paint circulating system pipes are painted yellow with two blue bands every 24 inches. All air lines are blue, water pipes plain yellow, structural steel maroon, and sprinkler lines bright red. The automatic spray machines, ovens, and spray booths are painted aluminum, and the floors, which are kept waxed and highly polished to facilitate the removal of dust, are brick red. The walls are made of glazed brick.

Room for All to Park

(*Continued from page 65*)

damages of school children for which employees are grateful; there is plenty of room for fire equipment should the need arise; and neighbors, who for the first time in a long while are able to park their own automobiles in front of their homes instead of three blocks away, are full of praise and thanks to the Zenith management.

However, one of the most important reactions (and one of the least expected) is the common sentiment that has risen among employees.

During these unsettled times, with wild rumors of the radio industry's existence being threatened by everything from material shortages to a personal visit from Hitler, it had a very sobering effect on the personnel to come down every morning and find Zenith working along sanely and steadily at an everyday project such as this.

Spending time and money in building for the present and planning for the future, develops the strongest kind of confidence.

When a management shows by a constructive, broadminded policy that it has both feet on the ground and is standing behind its employees 100 percent, it is going to develop that important feeling of security that reaps dividends in loyalty and good will.

Famous Heads

that have Increased Production

Elias Howe

Massachusetts farm boy who, in 1845, developed the sewing machine. His first machine proved that it could sew five seams more quickly than a skilled seamstress could sew one . . . heralding a new area of increased clothing production.

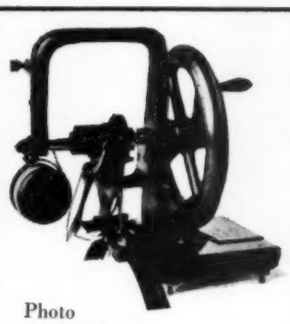


Photo of Howe's original sewing machine.

Another famous improvement that has helped to speed up assembling, maintenance and adjustment operations throughout industry is the KNURLING of "Unbrako" Socket Head Cap Screws. Eliminating the annoying, time-wasting slip characteristic of handling ordinary smooth-headed screws, KNURLED "Unbrako" Caps permit dry or greasy fingers to gear right to dry or greasy knurls . . . no fumbling or lost motions!

And KNURLING not only creates a better finished appearance, but permits quick, easy locking of the screw after countersinking.

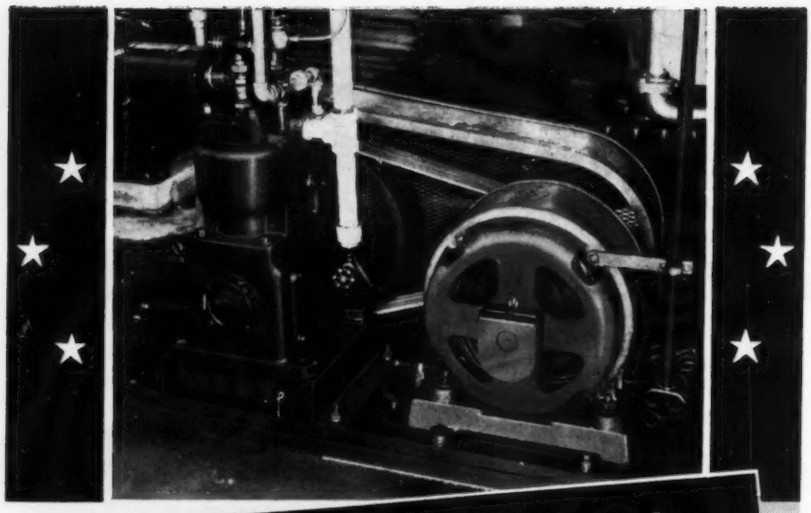
You can use "Unbrako" advantages! A sample order will prove it. Ask your distributor or write—

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. Box 546
— BRANCHES —
BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

KNURLING of Socket Screws originated with "UNBRAKO" years ago.

Reg. U.S.Pat. Office

UNBRAKO Screw Products



Cycle Company Installs Another
CURTIS COMPRESSOR
Because
It Compared Maintenance and Operation Costs!

The Shelby Cycle Company, Shelby, Ohio, uses air to operate pneumatic arbor presses, air hoists, paint sprayers and press die knockouts.

Their first Curtis compressor was purchased in 1933; because of its satisfactory operation, compactness of design and low operating and maintenance cost, *as compared to a compressor of another type*, a second Curtis unit was added when they needed more air.

This is but another example of the dependability and efficiency of Curtis Model "C" Air Compressors—proven by the operating records of thousands of installations throughout the world.

Curtis performance is the result of such advanced engineering and design features as Timken Roller Bearings, Carbon-free Disc Valves, Centro-Ring Oiling, and Precision Workmanship in every detail. All parts are extremely accessible—available in capacities up to 360 cfm.

Send the coupon or write for proof of Curtis economy—today.

CURTIS

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Curtis Pneumatic Machinery Division
of Curtis Manufacturing Co.
1995 Kienlen Avenue, St. Louis, Mo.
Please send me booklet "How Air Is Being Used In Your Industry."

Name.....

Firm.....

Street.....

City.....State.....

Let's Look at Substitutes

(*Continued from page 75*)

assemblies made of both zinc-coated steel strip and plain uncoated steel strip. A change in the gage was necessary to help control the weight factor.

Aluminum was originally selected for the coil fins because of its light weight, corrosion resistance, and good appearance. The tinned copper filled these last two requirements as it was received. For steel, however, these features must be added to the material. After the fin assembly is made, with either coated or uncoated steel, it is processed by being bonderized. It then receives a dip coat of zinc-chromate primer, followed by two coats of corrosion-resistant lacquer. The lacquered-steel fin assembly is then used to form the coil on the tinned copper tubing in the usual manner.

In an effort to be prepared for almost any eventuality, tests are now being made on a substitute for the chlorinated rubber lacquer originally adopted for this job. This substitute is a material of olco-resinous base specially modified through the vehicle and the selection of specific rust-inhibiting pigments to impart resistance to corrosive influences.

W. Haddon Judson Company. The cast aluminum housing of an electric fence controller, a unit designed to control the current fed into an electrically charged fence, weighed upwards of 4½ pounds, cost $3.45 to produce, required extra plastic and porcelain parts to insulate the control from the housing proper.

With the priority ruling on aluminum, Judson engineers looked about for other materials. Their experience in fabricating plastics led them to experiment with transparent plastic sheets, which they found could be shaped to the proper contours when heated. Today the company is producing housings of this transparent plastic material for $1.85 each. They weigh only 12 ounces and are turned out in molds costing a fraction of those required for cast aluminum.

Other advantages include elimination of extra insulation. A better-looking, weather-and-corrosion-resistant surface is obtained by enameling the transparent housing on the inside. Letterings and other workings are also applied on the inside, by decalcomania.

Royal Typewriter Company initiated a design program a year ago with the sole purpose of eliminating strategic materials from its product. Once a

Save Machining Time on Stainless Castings!

★ Save *time*, save *materials*—those are your marching orders today. Let Allegheny Stainless Castings help you. They're produced from steel melted in unique hollow-electrode furnaces, which permit closer-than-ordinary control of alloying conditions and purity.

Result: these castings are highly uniform in analysis and dense in structure. They're easy to machine and weld, and they assure a step-up in production and less spoilage.

But don't overlook a further factor. Where you can replace forgings with castings, even greater savings can be made—both in machining time and in raw materials, since there is much less steel to cut away.

Our Technical Staff is at your disposal on casting problems involving any stainless grade, any design, and any weight—from pounds to a ton and more. Meanwhile, *mail the coupon below* for data on Allegheny Stainless Castings.

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STEEL CORPORATION — PITTSBURGH, PA.
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Allegheny Ludlum Steel Corporation
Pittsburgh, Penna.
Send me a copy of your Stainless Castings Bulletin.
NAME_____
COMPANY_____
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FORESIGHT demands FLOODLIGHT!

WITH America at war, there can be no excuse for negligence these days . . . no excuse for trying to make hindsight answer for foresight. Every plant producing goods for war or even civilian needs is vitally important to the national welfare. Responsibility for guarding against sabotage is the problem of each plant individually.

Floodlighting of grounds is the first step in industrial protection. Do it *now!* Do it properly! See your nearest Goodrich distributor or write us.

We invite those responsible for providing safeguards against sabotage in industrial plants to write for this timely and helpful circular. Ask for folder No. 101.

GOODRICH
INDUSTRIAL LIGHTING

GOODRICH RLM

The Goodrich line includes a wide variety of incandescent and fluorescent fixtures for every industrial requirement. Literature on request.

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GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4604 BELLE PLAINE AVENUE, CHICAGO, ILL.

month design and production executives go over special inventory records and decide what steps to take to meet predictable materials shortages.

So far Royal has beaten every acute shortage to the draw—in most cases making changes several months before necessary. Nickel consumption has been reduced from 3,000 to 900 pounds monthly. Brass is conserved by switching to steel or plastics. All aluminum and zinc parts have been, or will be, eliminated. A partial list of substitutions follows:

Steel for brass in ribbon feed gear, card holder bushing, cylinder knob sleeve.

Plastics for porous bronze in large feed roll, small feed roll, paper holder roll bushing.

Plastics for brass in paper holder roll core, feed roll spacer, line spacer release knob.

Steel and wood (steel tube with wood core) for aluminum, brass, and zinc alloy in cylinder assembly.

Malleable iron for cast aluminum in type bar lever bracket.

Hardened carbon steel for stainless steel in ribbon vibrator, for brass in paper guides.

Westinghouse. Materials shortages resulting from increased demands of war production have led to many substitutions by company engineers:

High chrome steel for stainless steel in electric range heater tubes.

Enameled steel for aluminum in cover for electric roaster, in cooking well for electric range, in ice cube compartment door of refrigerator.

Steel for aluminum or zinc die casting in handles and hinges for refrigerators.

Spun steel for spun aluminum in searchlight reflectors.

Iron sheet with high-reflecting porcelain enamel finish or glass with silvered finish for aluminum sheet in reflectors.

Cast iron for zinc die castings in fan bases.

Cotton, glass, or asbestos for silk in insulation fabric.

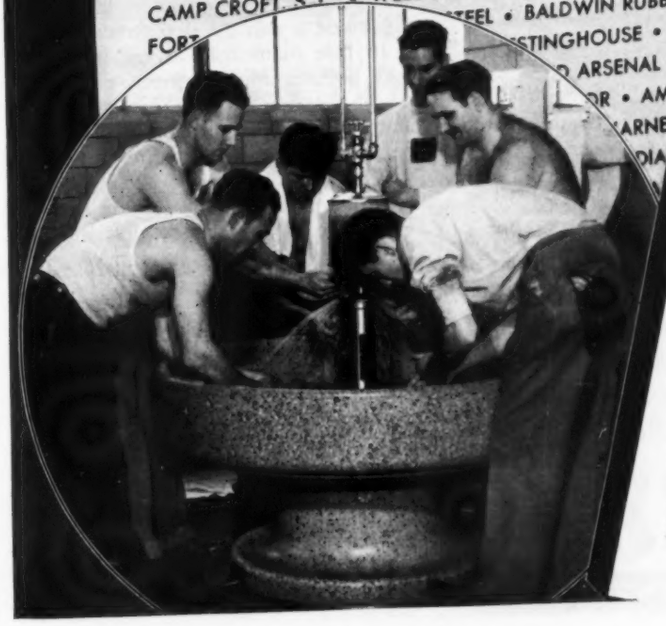
Old rope for mulberry fiber in insulation material.

Dehydrated castor oil, soy bean oil, citicica oil for tung oil in insulation varnish.

Warner & Swasey Company. Plastics replaces an aluminum casting in a device mounted on a turret lathe headstock to permit the operator to pre-select work speeds and shift gears, and to operate clutches and head brake with a single lever. Saves 1,400 pounds of aluminum monthly. Has reduced manufacturing costs 80 percent. The only machining on the plastic drum is drilling a small oil hole.

Partial 1941 Roll Call Bradley Washfountains

REPUBLIC STEEL • GLENN L. MARTIN CO. • BETHLEHEM STEEL • E. I. du PONT de NEMOURS • ALUMINUM COMPANY • REYNOLDS METALS • DOW CHEMICAL • FRANKFORD ARSENAL • MONSANTO CHEMICAL • PICATINNY ARSENAL • CARNEGIE-ILLINOIS STEEL CORP. • KANKAKEE ORDNANCE • INTERNATIONAL SILVER • EDGEWOOD ARSENAL • BROOKLYN NAVY YARD • GENERAL ELECTRIC • WOLF CREEK ORDNANCE • BOSTON NAVY YARD • FEDERAL SHIPBUILDING & DRY DOCK CO. • NEW YORK SHIPBUILDING CORP. • BETHLEHEM SHIPBUILDING CO. • FORD MOTOR • JOHN DEERE • U. S. NAVY YARD, MARE ISLAND • WRIGHT AERONAUTICAL • PORTSMOUTH NAVY YARD • REMINGTON ARMS • U. S. NAVAL ORDNANCE, LOUISVILLE • SPRINGFIELD ARMORY • STANDARD ORDNANCE, FORT BENNING • ST. JOSEPH LEAD CO. • RICHMOND SHIPBUILDING CO. • LOUISIANA SHIPYARDS • GOSS & DeLEEUW MACHINE CO. • NAVAL STATION, FLOUR BLUFF, TEXAS • INLAND STEEL • UNITED AIRCRAFT • U. S. ORDNANCE ENGINEERS • LE ROI COMPANY • McCULLOUGH ENGINEERING CO. • HUGHES AIRCRAFT PLANT • U. S. NAVY, CANAL ZONE • CALCO CHEMICAL • CATERPILLAR TRACTOR • U. S. NAVY, PEARL HARBOR, HAWAII • BREWSTER AERONAUTICAL CORP. • CINCINNATI SHAPER CO. • U. S. NAVAL ORDNANCE, CANTON • BARBER COLEMAN • NATIONAL MUNITIONS CO. • GADSDEN SHELL PLANT • NORFOLK SHIPBUILDING CO. • TODD SEATTLE DRY DOCKS • CRAMP SHIPYARDS • OREGON SHIPBUILDING CORP. • ACME STEEL • STANDARD ORDNANCE BLDG., FORT LEONARD • SPRINGFIELD ARMORY • JONES & LAUGHLIN • STEEL & TUBES, INC. • HERCULES POWDER • CHRYSLER CORPORATION • SAN DIEGO NAVY YARD • FORT CROOK BOMBER PLANT • ABERDEEN PROVING GROUND • LOUISIANA SHIPYARDS CO. • STANLEY TOOL WORKS • GREAT LAKES STEEL CORP. • TODD-BATH SHIPBUILDING CORP. • CAMP POLK, LEESVILLE, LA. • CAMP SHELBY, HATTIESBURG, MISS. • A. O. SMITH CORPORATION • NORTON COMPANY • CONTINENTAL ROLL & STEEL FOUNDRY CO. • STINSON AIRCRAFT DIV. AVIATION MFG. CORP. • BUICK • TIMKEN ROLLER BEARING CO. • PUGET SOUND NAVY YARD • GREAT LAKES STEEL CORP. • STUDEBAKER CORPORATION • CAMP BEAUREGARD, LOUISIANA • WESTERN CARTRIDGE CO. • HUDSON MOTOR CAR CO. • RAVENNA ORDNANCE PLANT, OHIO • NATIONAL CARBON • CRUCIBLE STEEL • HILL FIELD, UTAH • GOODYEAR AIRCRAFT CORP. • VULCAN CRUCIBLE STEEL CO. • CURTISS-WRIGHT • U. S. NAVAL STATION, GUANTANAMO BAY, CUBA • AMERICAN SMELTING & REFINING CO. • CONSOLIDATED STEEL CORP. • WATERTOWN ARSENAL • INTERNATIONAL HARVESTER CO. • ACE FOUNDRIES • [illegible] STEVENS DRY DOCK & REPAIR CO. • FISHER AIRCRAFT CORP. • AIR MAZE CO. • BROWN & [illegible] BEARING CO. • BUNTING BRASS & BRONZE CO. • TENNESSEE COAL & IRON [illegible] WICKWIRE SPENCER STEEL CO. • FORT BELVOIR, VIRGINIA • A[illegible] CRUCIBLE STEEL CO. • U. S. NAVAL AMMUNITION DEPO[illegible] CAMP CROFT, S. C. • WELDON SPRINGS CO. • AMERICA[illegible] FOR[illegible] STEEL • BALDWIN RUBBER [illegible] STINGHOUSE • C[illegible] ARSENAL • [illegible] OR • AME[illegible] ARNE[illegible] DIA[illegible]



Space does not permit a Roll Call of all the thousands of Bradley Washfountain installations but a representative list for the year 1941 is given above.

Bradley Washfountains provide modern washing facilities in plants of all kinds and sizes. Because they are sanitary and self-flushing they prevent skin affections and loss of man-hours, provide more facilities in a given space, give each of the eight to ten persons washing simultaneously clean running water. They require 80 per cent fewer piping connections than conventional single-person wash basins, and therefore require less installation and maintenance time and expense.

Bradley Washroom Consultants will help rearrange your present washrooms and lay out new ones for greatest efficiency and convenience. BRADLEY WASHFOUNTAIN CO., 2215 West Michigan St., Milwaukee, Wis[illegible]

Here's a Jam Cracker!

Crack those jams, make work easier, increase the productive capacity of your employees and your plant with R & M *All-Steel* Hoists.

These new R & M hoists are designed for today's super-production demands—with steel construction from track to hook . . . typical American reliability for 24-hour-a-day service . . . ability to handle loads from any angle with perfect balance . . . speed plus safety . . . capacities ranging from 1,000 to 15,000 lbs. . . . and power from famous R & M motors.

Note the low headroom that saves vitally needed plant space, and remember—R & M All-Steel Hoists are guaranteed by a firm that has done nothing but quality building for more than 50 years.

Mighty busy we are with our own war production problems. But helping you help Uncle Sam is part of our job. So tell us about your material-handling problems and you'll get a quick, practical answer that will save hours of precious time and may save you thousands of dollars.

Write today for Folders 800 and 801-F2 giving complete specifications on the entire R & M Steel Hoist Line.

ROBBINS & MYERS • Inc.

HOIST & CRANE DIVISION • SPRINGFIELD, OHIO

MOTORS • FANS • MOYNO PUMPS • FOUNDED 1878

Erie Gets In the Scrap

(*Continued from page 68*)

about conditions inside the plants as the foremen. Hence it was logical to call on the president of the Foremen's Association to serve on the Exectuive Steering Committee, where he would take part in the discussions, learn of new plans and methods, and be in a position to transmit this information to the members of his group.

The foremen readily agreed to cooperate fully with the program, and went to work with a will on a general clean-up of the plants. Their efforts bore immediate and practical results. No one would have believed the amount and value of the scrap and waste that was lying around in the factories and mills of the city. Industrial Erie never has had such a housecleaning.

Under the new conservation regime, every shop in Erie now boasts a new executive—the salvage manager. His duties consist in searching out scrap and waste, and wrecking obsolete machinery and equipment for its scrap content. He directs the piling of scrap and waste so that no two metals are mixed. This is not only a boon to the waste material dealers, because it simplifies their sorting problem, but also, in many instances, it helps the company itself to reclaim a large part of the scrap for its own use, or for sale at a higher price. Smaller concerns were able only to allot a man part time to this work, or to assign a man full time during the clean-up campaign period only. Larger establishments immediately appointed a man full time, and in a few instances organized a salvage department.

In one plant the salvage manager may be the chief engineer, or someone he appoints from his staff. In another plant, he may be the maintenance man, or one of the foremen. The salvage manager is also responsible for making weekly reports to the Executive Committee so that the information may be summarized and sent to Washington.

To cite how the salvage drive is organized in an individual plant, the Erie Works of the General Electric Company has been carrying on salvage operations for several years, under the direction of Floyd E. Bliven. In this building there are five magnetic separators, operated by three men. Each separator serves a special purpose. The simplest one is a 12-in. magnet which travels over a sorting bench. The most intricate is a horizontal type with two traveling belts

SIMPLE CLAMP-AMMETER MAINTENANCE TESTING IS THE ORDER OF THE DAY . . . TO INSURE UNINTERRUPTED OPERATIONS AT PEAK EFFICIENCY . . . TO FORESTALL COSTLY BREAKDOWNS . . . TO SAVE EVEN THE PRECIOUS MINUTES USUALLY LOST IN ROUTINE TESTING. IT'S A TOOL THAT WILL HELP YOU WIN THIS "ROUND-THE-CLOCK" PRODUCTION BATTLE.

THE WESTON
AC CLAMP-AMMETER

Tests without disturbing circuits... without interrupting machinery. Simply close the jaws around the conductor, bus-bar or switch-blade and take the current reading. Provides the simplest, quickest means for periodic testing to insure "top" operating efficiency, and safeguard against maintenance troubles and power losses. Has 6 AC current ranges for maintenance needs. Weston Electrical Instrument Corporation, 628 Frelinghuysen Ave., Newark, New Jersey.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters... Aircraft Instruments... Electric Tachometers... Dial Thermometers.

FOR OVER 53 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

CELLU-LINED

Hydraulic Hose for High Pressures

OIL PROOFED with CELLULOSE

Cellu-lined hose is oil-proofed with multiple layers of cellulose, a material completely resistant to hydrocarbons, i. e.—hot oils, etc.

BURST PRESSURES to 23000 P.S.I.

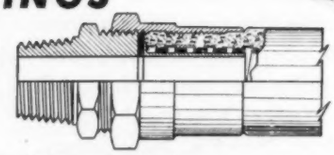
Great strength of Cellu-lined hose is obtained by imbedding metal braid covering in the synthetic casing.

SIZES 3/16" I.D. to 1 INCH I.D. (incl.)

Available sizes of Cellu-lined hose (I. D. measurements): 3/16", 1/4", 3/8", 1/2", 3/4" and 1".

CELLU-SEAL COUPLINGS

Couplings for Cellu-lined hose are available with standard I. P. T. or S. A. E. threads.



Write for Catalog and Engineering Recommendations on specific problems involving flexible connections.

CHICAGO METAL HOSE CORPORATION

MAYWOOD, ILLINOIS

and ten smaller magnets. These separators segregate steel particles and iron content from non-magnetic particles, which are cleared from the belts by agitation and turning over.

In a fanning mill, air is blown through a stream of copper turnings, to drive the mica grains from the copper. Manganese copper may have a content of 2 percent iron, while phosphor copper is entirely non-magnetic. Hence these two types of copper must have different treatments, but they are separated by the magnets. A change in the field strength of the magnets makes possible the separation of monel metal from stainless steel clippings.

These separators were developed in the engineering and research laboratories of the General Electric Company to reclaim scrap metal, much of which goes back into production.

In one year, 1,125,000 pounds of scrap was processed through this department. Where only one metal was involved, 77.6 percent of the original weight was recovered; where two metals were mixed, 10.3 percent, and where three or more metals had to be separated, percentages of 5.9 to 6.3 were achieved.

These excellent results were obtained, according to Mr. Bliven, because the foremen and workmen cooperated closely in the prescribed methods of sorting and piling scrap metal so that the work of the salvage department was simplified.

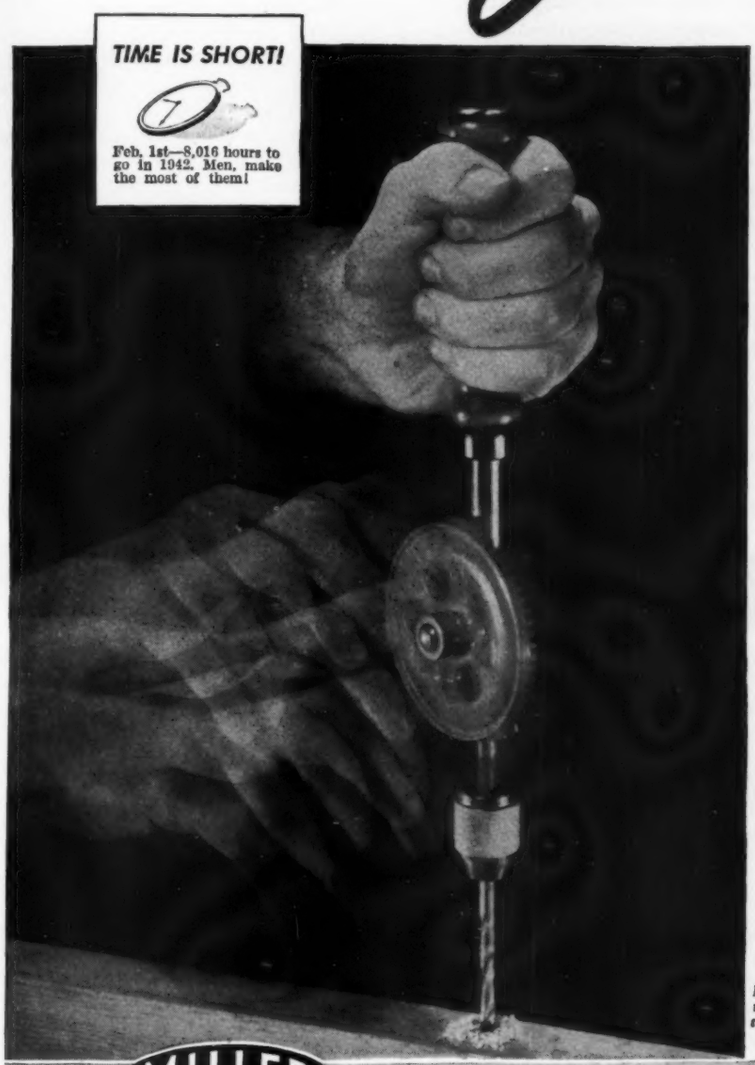
It was made plain to the waste material dealers of Erie that the Committee had no intention of interfering with established methods of doing business. It did not expect to gather the scrap, or have anything to say about the price structure.

All it was interested in was carrying out instructions of the Bureau of Conservation of the OPM. Those instructions were quite clear—scrap and waste were to be collected promptly and made available to local or out-of-town markets.

One of the interesting results of the campaign is that these dealers, who thought they were doing pretty well when they turned over their stock twice each year, began to turn it over every four days, and, in some instances, every 36 hours. The dealers haven't had to look for a market. The market is looking for them. And they are glad to call as often as they are invited, because it means a quick turnover for them, and more business than they have ever had.

Shops and shop yards in Erie have had the clean-up of their lives. Tons of short ends, clippings, chips, turnings, blocks, waste paper, scrap rubber, burlap, and even strings, have

What you can do to help busy hands work *faster!*



A MILLER Continuous Wireway Fluorescent Lighting System in your plant will minimize worker eye fatigue . . . increase production efficiency . . . speed war effort.

Here's a *proven* way to help your men work better, faster, more surely and with less eye fatigue. Install MILLER 50 FOOT CANDLER or 100 FOOT CANDLER in your factory areas and MILLER TROFFERS in offices and drafting rooms.

Help them see what they're doing clearly and sharply with 50 foot candles or better of working light.

This is a "working tool" we're talking about. At a cost of a few pennies per man-hour it will return dollar wonders in production for you. It is doing that today for other leading *offense* plants.

Prompt response from you will enable us to speed deliveries, render you superlative service. Act today. *(Representatives in principal cities.)*

•

Be sure you get these 5 MILLER fluorescent lighting benefits

HIGHER ILLUMINATION . . . 50 to 100 foot candles—with uniform light distribution.

30 TO 50% LOWER INSTALLATION COSTS . . . Make war production dollars go further.

FASTER INSTALLATION . . . Steps up building schedules—plants get into production quicker.

SIMPLIFIED MAINTENANCE . . . Easty-to-clean, removable porcelain-enamel reflectors—save man-hours for production.

ALLOWANCE FOR FUTURE LIGHTING NEEDS . . . illumination can be increased 45% without new fixtures—lower obsolescence.

Multiflash photograph made especially for this advertisement by Paul Wing

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS
Continuous Wireway Fluorescent Lighting Systems

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844
• MILLER offers a complete line of filament and fluorescent lighting equipment

The WRIGHT Line FOR HIGH SPEED PRODUCTION

There is a *Wright* hoist for every job —the **WRIGHT SPEEDWAY ELECTRIC HOIST,** the **WRIGHT IMPROVED HIGH SPEED HAND-OPERATED HOIST,** the **WRIGHT TRAVELING CRANE, JIB CRANE, MONORAIL TROLLEY.** They handle anything from ¼ to 50 tons—*fast*, safely, economically.

But you get more than the hoist fitted exactly to your needs. *First*—you get the Wright engineering experience which assures you the most economical solution of your problem with the **WRIGHT HOIST.** *Second*—you get inbuilt safety in every part. The load chain, for instance, has a safety factor of 7 to 1. The bottom hook slowly opens to indicate overload.

This drop forged, special steel hook, possesses such an unusual degree of ductility it will straighten out before any part of the hoist is damaged. *Third*—assured operating efficiency is a characteristic of every **WRIGHT HOIST.** Their action is smooth, positive, fast. Finally—Wright gives you year-in-and-year-out dependability and the very minimum of maintenance cost.

Let Wright engineer your hoisting and crane problems. Work through the Wright distributor in your city. You'll find him listed in the classified telephone book.

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA
In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

been picked up, sorted, and piled for the waste dealer's truck.

Shops have got rid of an accumulation of odds and ends. Improved methods have been put into effect in every factory for saving all material possible in manufacture. Spoilage, always a difficult problem, is now unpatriotic, and is frowned on by the workmen themselves.

Mechanics, machine operators of all classes, are picking up nails, screws, small metal articles, and tossing them into receptacles provided for that purpose, each plainly labeled as to classification. One man in a refrigerator plant found a way to save three square inches of metal on each door. Th ecompany rewarded him with a check for $60.

Following the visit of the OPM representatives, the Executive Committee arranged with the Bureau of Industrial Conservation to appoint a member of the committee who would serve as liaison contact with the Bureau's Industrial Salvage Section, to secure the services of experts as and when needed, or other cooperative assistance. The objectives of this arrangement were to:

1. Make available the services of a thoroughly experienced salvage expert for consultation on specific problems;

2. Supply speakers for important meetings;

3. Supply information regarding methods found practical and profitable in other industrial cities;

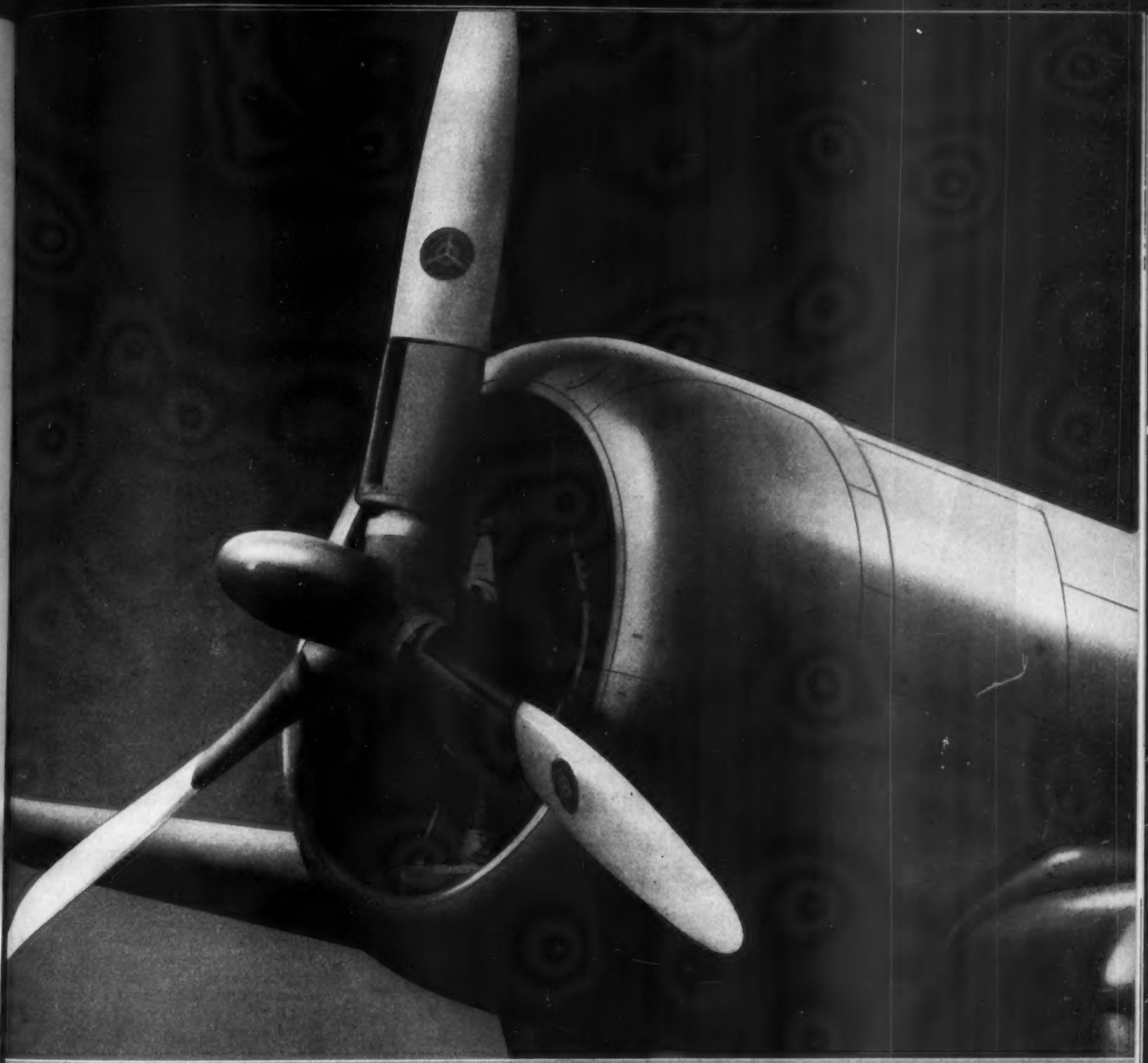
4. Arrange a series of awards provided by the Bureau; and

5. Supply posters, displays, notices, cartoons, press releases, and other publicity.

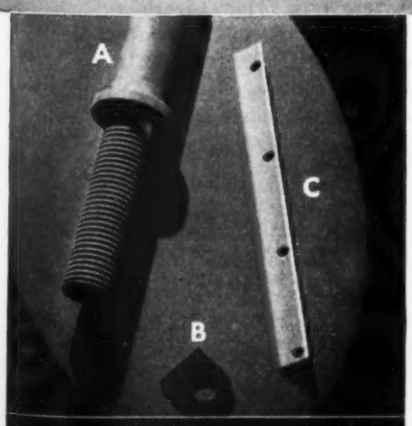
To date the Bureau has one 2-color poster entitled "Get In the Scrap" which is available to all industries participating in the salvage program.

The Association has issued a 5½ × 8½-in. booklet describing the Erie plan for manufacturers' associations, chambers of commerce, or other organizations of industrial leaders who are interested in the problems of industrial salvage and conservation. It believes that it is working out in a practical, realistic manner a problem that has a vital bearing on the present economic struggle.

The Erie plan has brought about many general beneficial results, in addition to the tonnage of scrap uncovered and made available for production. Industries have improved their housekeeping methods, and attained thereby decided improvements in safety, sanitation, employee welfare, reclamation of formerly wasted materials, and production methods.



Reducing Diet for Propeller Parts: SYNTHANE



A—Turned and threaded stud for steam shovel
B—Shaved and drilled insulator
C—Sawed, milled, drilled and counterbored card guide

EVERY pound of weight saved means just that much longer range for a bomber, added payload for a transport. Light-weight Synthane is used for many parts of airplanes, including propeller assemblies.

The same light weight, corrosion resistance, structural strength, dielectric strength, machineability... and other properties that took Synthane into the plane, the tank, and the warship will find a larger place later in appliances for the home, equipment for the office and the factory.

Already, companies... looking ahead...: are planning future applications using Synthane Bakelite-laminated. If you have a future use for versatile Synthane, why not gain time tomorrow by working on it today? We'll be glad to help you.

SYNTHANE CORPORATION, OAKS, PENNSYLVANIA

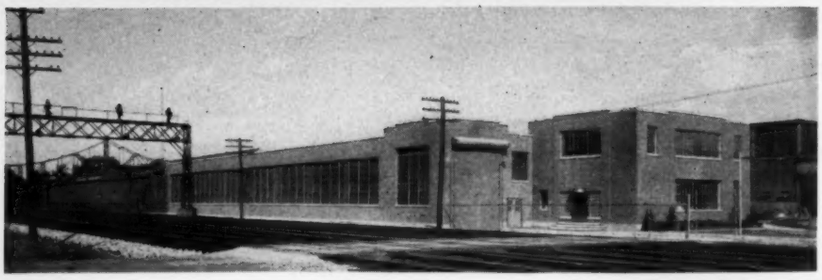
SYNTHANE TECHNICAL PLASTICS

SHEETS • RODS • TUBES • FABRICATED PARTS

SYNTHANE
Bakelite—laminated

SILENT STABILIZED GEAR MATERIAL

by PITTSBURGH-DES MOINES



DEFENSE PLANT ADDITIONS

OR ENTIRE

New-Building Projects!

QUICKLY PROVIDED COMPLETE UNDER ONE RESPONSIBILITY AND UNCONDITIONAL SATISFACTION GUARANTEE

If your work is of pressing importance to America's industrial war effort, this Company can build the additions to plant you need — fast, and with dependable fabrication and erection that will keep your structure serving with satisfaction long after victory is won.

For the general picture, write. For immediate consultation — phone or wire our nearest office.

PITTSBURGH-DES MOINES STEEL CO.

PITTSBURGH, PA. 3458 NEVILLE ISLAND—DES MOINES, IA. 959 TUTTLE ST.

NEW YORK, ROOM 944, 270 BROADWAY . . . CHICAGO, 1262 FIRST NATIONAL BANK BUILDING

DALLAS, 1263 PRAETORIAN BUILDING . . . SAN FRANCISCO, 665 RIALTO BUILDING

SEATTLE, 1166 EIGHTH AVE., SOUTH

Management Shorts

(*Continued from page 86*)

the good nuts, making necessary a 100 percent inspection of the full day's work.

A stop was placed in the delivery chute to hold back a 15 minutes' supply of tapped nuts. Now if the operator's inspection discloses a bad tap, it is replaced, and this 15 minutes' supply is removed and inspected before being placed in the receiving bin. If the inspection reveals no defects, the nuts are allowed to pass the stop into the receiving bin. With this procedure only about one hour's work a day has to be inspected, instead of the full eight hours' work, as was previously necessary.

•

They Don't Wait for the Elevator Now

PAUL H. TAUB, Niagara Box Factory, Inc., New York

Our plant is in a 6-story building with only one freight elevator. Much interfloor shipment of materials has to be made, and a great deal of time was wasted by letting the men on each floor wait for the elevator, to tell the elevator operator where the material was to go.

We have had cards printed containing such instructions as "Deliver to 5th floor." A supply of cards is kept in a box next to the elevator. The cards are 6x6 inches with the floor numerals about 3 inches high, and are printed on heavy white cardboard.

Now, all the men have to do is to leave the material in front of the elevator and drop the correct card on the load. After ringing for the elevator they return to their regular work. The elevator operator returns the card to the box and makes the indicated delivery. This system has eliminated all the time previously wasted waiting for the elevator.

•

Pneumatic Conveyor Handles the Job

P. A. KETCHPEL, West Englewood, N. J.

Two belt conveyors were used to carry blanks from beneath the blanking press to a high rotary screen, which took out the piercings and then discharged the blanks under the rolls, and to raise the blanks to a storage box 36 inches high. With this handling method there was a great deal of trouble with spillage.

So a new method was adopted. The screen frame was raised so that a storage box could be placed directly beneath the screen to receive the piercings, and another placed beneath the rolls to receive the perfect blanks. Then a pneumatic con-

In seeking better products for industry and the public

One of Gulf's research laboratories, Harmarville, Pa.

they also found

better products for DEFENSE

THROUGH the years the men of science who work in the great petroleum research laboratories have been entrusted with the responsibility of devising ways and means of providing industry and the public with products which improve the performance of machines and motor vehicles and reduce maintenance costs.

It is fortunate that in achieving this objective, petroleum research has brought out many aspects of petroleum technology that have proven to be of vital importance to our national defense efforts.

Research, in giving us better gasoline for our motor cars, has also given us super-fuels for our fighting and bombing planes.

In searching for uses for by-product refinery gases, research has given us processes for the manufacture of synthetic rubber.

In exploring the nature of petroleum hydrocarbons, research has found new sources of toluene, glycerine, and processes for producing materials required for the newer explosives.

In the study of cracking processes, research has learned how to make the chemical intermediates used in the manufacture of the plastics which are required directly for defense purposes and as a replacement for metals needed in defense.

In meeting the challenge for lubricants to satisfy our peace-time needs, research has developed the kind that will permit our fighting as well as our industrial machines to operate at highest efficiency in this emergency.

This list of developments that can be credited to petroleum research is far, far from complete. It serves, however, to emphasize the importance of the technologists' peacetime contributions to war-time needs.

Thanks to the petroleum industry's policy of constant improvement of products for industry and the public, we have better products for defense—and we have them now!

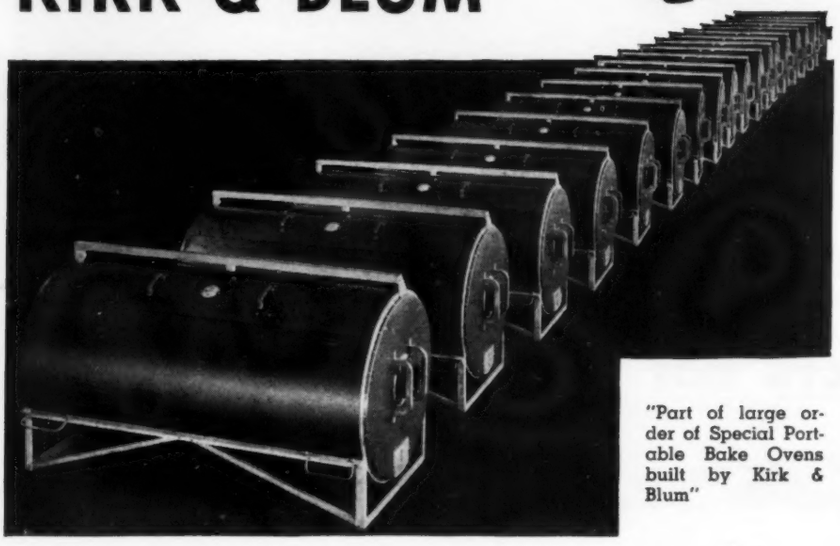
GULF OIL CORPORATION · GULF REFINING COMPANY · PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

KEEP 'EM ROLLING

SUB-CONTRACT
Your SHEET, STEEL
and LIGHT PLATE
WORK *to*

KIRK & BLUM



"Part of large order of Special Portable Bake Ovens built by Kirk & Blum"

We have the modern facilities, manned by skilled workers, to design, manufacture and assemble sheet metal parts.

A specialized service set up for fast and economical production of single units or in quantity.

We fabricate Stainless (all types) Aluminum, Monel, Brass, Copper, Angle and Bar Shapes.

Send your Blue Prints for Prompt Quotations

The **KIRK & BLUM** *Manufacturing Co.*

2835 Spring Grove Ave.
CINCINNATI, OHIO

OVER 30 YEARS EXPERIENCE in

Shearing, Punching, Bending, Stamping, Pressing, Welding, Forming, Rolling, Wiring, Edging, Hammering, Flanging, Beading, Riveting, Assembling.

veyor was built to carry blanks up to a settling chamber. Using air from a blower system on the floor below, the blanks are simply blown in a 4-in. pipe from beneath the press up to the settling chamber and allowed to trickle onto the rotary screen. Since this is a closed system, it has eliminated the great amount of spillage on the floor. In other ways it has resulted in time savings, saving one and one-half hours of operators' time every eight hours, time that can be given to useful production.

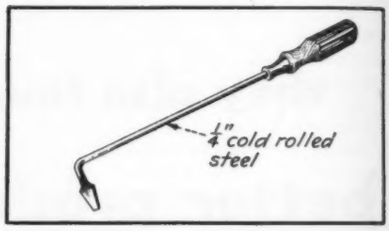
It cost $189 to make the change, and approximately two to three times this amount will be saved yearly in labor and maintenance costs. The present installation takes up less floor space, provides a neater workplace, and contributes to the operator's peace of mind.

•

Screwholder Saves One Man's Time

J. MURPHY, Lakewood, Ohio

In assembling desks, trays, and platforms, where long reaches are necessary to drive machine screws and stove bolts, this sim-



ply made 24-in. screwdriver or screwholder enables one man to do the job without a helper. Operating this tool with his left hand, the mechanic can hold the screw or bolt while he uses his right hand to set the nuts and the washers.

•

Give a New Man His Head and He'll Use It

GORDON W. RICHARDS, Orange, N. J.

Practically by accident the foreman of a large toolroom found that by relying upon the "inventive brains" of his workmen he could save considerably on designing costs.

During a rush period, with the drawing boards tied up for weeks in advance, there were some small jobs that just had to be gotten out. Formerly, every tool, no matter how small, was always first "designed". Having no time to "design" now, the foreman started by calling a workman into his office and outlining with a quick sketch just what was needed on that particular job.

To his surprise the man went ahead and did the job without any further questions.

The foreman did the same on other jobs, some jigs and fixtures, and found

PLANTS THAT MUST BE BUILT FAST CAN BE BUILT *FASTER* with SKILSAW TOOLS!

NEW plants, enlarged plants, remodeled plants—they're needed *FAST* for America's victory . . . they're finished *FASTER* when SKILSAW TOOLS are on the job, speeding up building each hour of each day. *Are skilled hands scarcer?* One hand with SKILSAW does the work of ten! *Is time too short?* SKILSAWS cut days from schedules . . . SKILSAW DRILLS punch holes in bottlenecks! *Do you want proof?* 9 out of 10 defense contractors use SKILSAW TOOLS! Ask your distributor for a demonstration.

SKILSAW trims roof sheathing faster . . . after it is nailed in place to save extra time.

SKILSAW quickly cuts plywood panels . . . speeds up concrete form work . . . makes pocket cuts swiftly.

SKILSAW DRILL speeds up timber boring. Powerful, yet compact for drilling in close quarters.

SKILSAWS speed up *all* sawing in maintenance, remodeling and construction. Cut out old flooring . . . make pocket cuts in walls and floors for service pipes and ducts. Size and trim all lumber . . . cross-cut, bevel-cut, rip and groove. 9 Powerful Models.

SKILSAW DRILLS are as fast on maintenance and remodeling work as they are on production! Do all drilling from lightest lead holes for hardware and fixtures to heaviest boring in construction. Swiftly drill holes for all conduit and pipes. 22 Powerful Models.

SKILSAW, INC., 5043 Elston Avenue, Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit • Indianapolis • St. Louis
Kansas City • Atlanta • New Orleans • Dallas • Los Angeles • Oakland • Seattle • Toronto, Canada

SKILSAW PORTABLE ELECTRIC TOOLS

★ FOR THE DEFENSE OF AMERICA ★

R/M PACKINGS *help you* JUGGLE WAR PRODUCTION

Even under the increased speeds and strains and stresses of industry geared for war, R/M packings keep everything under control. Gas, air, water, oil, and vital chemicals flow smoothly, operate efficiently, *keep going*. For R/M packings last—and last. Machinery does not break down. Repairs are reduced. Production speeds up without a hitch—maintains overtime schedules without dangerous delays.

To a nation at war R/M is important as never before. *For R/M is dependable!*

Your production problems can be solved with the right R/M packing. Ask your jobber for the complete cross-indexed catalogue of the most compact line of packings anywhere, or write us for a copy—on your business letterhead. Specify R/M—and

Keep Machinery Rolling!

INDUSTRIAL SALES DIVISION
RAYBESTOS-MANHATTAN, INC.
MANHEIM, PA.
BRIDGEPORT, CONN. NORTH CHARLESTON, S. C. PASSAIC, N. J.
Makers of Packings for Every Industrial Use

out that his men were really lots better than he had ever imagined. They had brains if left to use them. As a matter of fact a sketch was often not needed, just a print of the completed piece the jig, fixture, or die was to produce.

This system is not as dangerous as it may sound. For one thing, the men like the added responsibility. They take a new pride in their work. And they are men with experience. Frequently they furnish ideas that are more practical from a production standpoint than if they had come off a drafting board.

Here is a foreman who is making friends with his workers by freeing them of slavery to some sacred "design" drawing, and at the same time is saving 20 to 30 percent on tooling costs.

•

Skids and trays specially designed to handle the many different kinds of products manufactured, speeded up production schedules in a western plant.

•

Uses Back of Original Letter for Carbon Copy

M. L. McKEAND, Oak Park, Ill.

Because of the difficulty of getting paper and metal office supplies, I have begun using the back of the original letter for the carbon copy of the reply. There are several advantages to be derived from this practice. First, you save the paper usually used for the carbon of your answer. Second, you eliminate the metal wire staple, pin, or paper clip which may soon be difficult to get. Third, a single sheet requires less space in the files. And, fourth, any possibility of the carbon copy becoming separated from the original letter and lost is completely eliminated.

•

For Forewomen, White Skirts, Red Blazers

SOURCE—The Calvert Distilling Company, Louisville, Ky.

All operators in the bottling room wear white uniforms with red trim. The forewomen, by contrast, wear white skirts and bright red blazer jackets. Thus, each forewoman can be seen the entire length of the long room and can be summoned as needed, no matter where she may be along the conveyorized machine and hand-labeling line. This saves a lot of time as compared with having the supervisors in less conspicuous dress. Also, the costume is distinctly attractive, which is something to be considered in view of the heavy traffic of plant visitors who pass through on the balcony while sight-seeing the distillery.

For every industrial service there is a JOHNS-MANVILLE INSULATION specially designed to provide highest operating efficiency, long life and maximum fuel savings - - -

Here are brief facts on a few of the most widely used J-M Insulations. For full details, and for information on J-M Insulation Engineering Service, write Johns-Manville, 22 E. 40th St., New York, N.Y.

• • •

FOR STEAM LINES UP TO 600° F.—J-M 85% Magnesia Pipe Insulation. For many years this material has been proving its ability to maintain its high insulating efficiency in service. It is the most widely used power-plant insulation.

FOR STEAM LINES UP TO 700° F.—J-M Asbesto-Sponge Felted Pipe Insulation is recommended where maximum efficiency, salvage value and resistance to vibration and abuse are essential.

FOR HIGH-PRESSURE SUPERHEATED STEAM LINES—J-M Superex Combination Insulation, consisting of an inner layer of Superex high-temperature insulation and an outer layer of J-M 85% Magnesia or Asbesto-Sponge Felted. Combines unusual heat resistance and high insulating efficiency.

FOR BOILER DRUMS, WATER WALLS, FEED-WATER HEATERS, TANKS, BREECHINGS AND UP-TAKES—J-M 85% Magnesia Blocks for temperatures up to 600° F. Strong, durable, lastingly efficient.

FOR COLD-WATER LINES—J-M Anti-Sweat Pipe Insulation—a cold-water pipe insulation designed to prevent condensation and damage from dripping.

FOR REFRIGERATED SERVICE—J-M Rock Cork Sheets and Pipe Insulation—basically mineral, Rock Cork cannot rot and will not harbor vermin or support mold. It is highly moisture-resistant and retains its unusually high insulating efficiency indefinitely. Widely used for refrigerated equipment and piping, air-conditioning ducts and cold-storage rooms.

FOR FURNACE INSULATION—J-M Superex Blocks, for years the most widely used block insulation for temperatures up to 1900°F. Combines high heat resistance with low thermal conductivity.

J-M Insulating Brick (3 types) and J-M Insulating Fire Brick (4 types) for temperatures up to 2600° F. Furnished in all standard 9" shapes of the 2½" and 3" series, as well as in special shapes.

Also J-M Sil-O-Cel C-3 Concrete, cast on the job from Sil-O-Cel C-3 aggregate and cement. Sets up into a strong, durable semi-refractory insulating concrete for temperatures up to 1800° F.

An urgent need in Defense production

Hot foods
Hot soup
Hot coffee
for workers

Here's the low-cost way to provide them

Showing 5 food-pan assembly in vacuum-insulated carrier.

4 standard sizes.

AerVoiD portable vacuum insulated food, soup and... coffee carriers

Vacuum-insulated soup and coffee carriers.

6 standard sizes.

After all, Defense Production narrows down to keeping man-power on the job!

To that end factory managements are beginning to concern themselves with hot foods and beverages for workers . . . something more energizing than "cold lunches" to keep workers fit and to offset production-lag. They realize that both good will and good work are enhanced by hot foods for workers.

for servicing anywhere about the plant, indoors or outdoors

AerVoiD vacuum-insulated food, soup and coffee carriers step into this picture and do a job no other equipment can do. Hot foods and beverages can be kept hot for hours in AerVoiD vacuum insulated carriers, even though transported miles in outdoor cold-weather temperatures. No installation, low first cost, practically no operating cost, affording "throughout the plant" service, one building or 20 acres of buildings. Nearly 100 Defense Plants already use AerVoiDs to supplement cafeterias, to service hot foods without cafeteria set-ups. Write today for illustrated literature.

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BOOKS

THE FUNDAMENTALS OF INDUSTRIAL PSYCHOLOGY

Albert Walton, Ph.D., associate professor of psychology in extension. The Pennsylvania State College. McGraw-Hill Book Co., 330 W. 42nd St., New York. 231 pages. Index. $2.

Prepared primarily for use as a text in connection with foreman training classes in industrial plants. The new type of leader gets things done by reconciling what he wants with the desires and purposes of others, and profiting by the knowledge of human behavior that has been accumulated and verified by scientific workers.

PLANT PRODUCTION CONTROL

Charles A. Koepke, administrative assistant, Institute of Technology, University of Minnesota. John Wiley & Sons, Inc. 440 Fourth Ave., New York. 509 pages. Photographs, drawings, diagrams, tables, index. $4.

Describes the problems involved in planning for the production of goods in a modern factory, with the minimum confusion and expense. Attempts to resolve the problems into the functions which are necessary for controlling production in almost any situation. Study of these functions and their interrelationships will allow the student to synthesize a group of operations that later can be systematized.

CURTAILMENT OF NON-DEFENSE EXPENDITURES

Henry P. Seidemann. The Brookings Institution, Washington, D. C. 54 pages. 25¢.

Pamphlet No. 30. Analysis of current non-defense expenditures, and suggestions about how these expenditures can be cut by more than $2 billion.

HANDBOOK OF FEDERAL LABOR LEGISLATION

Division of Labor Standards, U. S. Department of Labor. 150 pages. Tables, forms.

Bulletin No. 39, Part II. Contains summaries of the principal federal labor laws and how they operate, what agencies administer them, how to file claims or complaints. Topically arranged. A loose-leaf publication for which pages will be sent for insertion and replacement approximately once a year.

SAFETY SUPERVISION

Vernon G. Schaeffer, Ph.D., assistant professor of psychology in charge of supervisory training in industry. The Pennsylvania State College. McGraw-Hill Book Company, 330 W. 42nd St., New York, 352 pages. Index. $2.50.

Pennsylvania State College Industrial Series. Discusses the human element involved in the problems of the supervisor who must promote safety in his division. Practical situations are viewed, and methods of dealing with them pointed out.

PRACTICAL ARC WELDING

W. J. Chaffee. Hobart Trade School, Inc. Troy, Ohio. 516 pages. Photographs, forms, diagrams, charts, index. $2.

A text book designed to give students such a thorough grounding in the fundamentals of

New Shipping Regulations Stimulate Analysis of Fastening Methods

Changes in the regulations governing shipping of freight in corrugated and fibre containers made by the OPM to save approximately 10% of the paperboard used in that manner, have stimulated an increasing interest in the packing method employed.

It is generally felt that by reducing the thickness of boxes required to carry different weights, and by restricting size limitations, it has become all the more important to insure safety in transit by using the strongest, most shock-resisting and damp-proof fastening that can be obtained.

"Ride tests" of sample packs under the liberalized regulations definitely favor steel-stitching and stapling as the most effective, as well as the most economical fastening method under the new conditions.

Shippers who have agreed that Bostitch stitchers and stapling machines speed up shipping room operations and save floor space, have now found that Bostitch staples also stand the test of transit better than any other types of fastening.

In many cases, this is attributed to the "clinch" of the steel staple, which acts like a spring to cushion the shocks of transit without breaking or tearing loose. In addition, the staples' grip is unaffected by refrigeration or dampness.

The remarkable adaptability of *wire stapling* to different tasks is illustrated by this fruit container, strongly fastened with a few staples by a high-speed Bostitch machine. Note the neatness and advertising value of this "air-conditioned" package, made possible by wire stapling.

For further information on packing methods in connection with changing shipping regulations . . . for facts and case studies describing how stitching and stapling machines cut costs and enable you to get the most out of scarce shipping materials . . . write BOSTITCH, 61 Blackmore St., East Greenwich, R. I.

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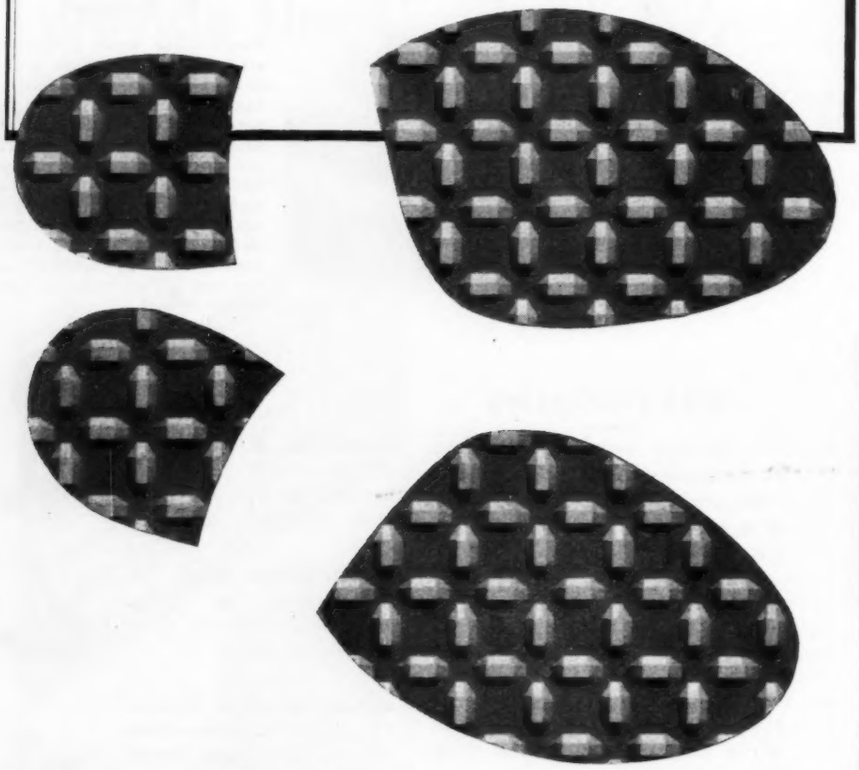

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arc welding that they are qualified for a wide variety of applications and can quickly adapt themselves to the specialized needs of the day. In five parts: General information; operator training course; carbon arc welding and cutting; definitions of welding terms; useful information.

SHOP THEORY

Prepared by the Shop Theory department, Henry Ford Trade School. McGraw-Hill Book Co., 330 W. 42nd St., New York. 267 pages, lithographed. Photographs, diagrams, forms, charts, index. $1.75.

Complete handbook for students of shop work. Written in simple English, principally in question-and-answer form. Profusely illustrated. Chapter headings include: Decimal equivalents, formulas, small tools, rules, micrometers, vernier gages, chisels and chipping, hack saws and sawing, files and filing, soldering, gearing, cutting tools, turret lathes, milling machines, heat-treatment, grinding machines, and many others.

•

ON THE CALENDAR

FEBRUARY

4–6, American Management Association, Personnel Conference, Chicago. Frank F Gilmore, Conference Planning Manager, 330 West 42nd St., New York.

16–20, National Electrical Manufacturers Association, Chicago. R. J. Blais, Convention Manager, 155 East 44th St., New York.

MARCH

2–6, American Society for Testing Materials, Spring Meeting, Cleveland. R. E. Hess, Assistant Secretary, 260 South Broad St., Philadelphia.

3–6, Safety Convention and Exposition, Annual Meeting, New York. Greater New York Safety Council, Lincoln Building, 60 East 42nd St., New York.

4–5, American Management Association, Marketing Conference, New York. Frank F. Gilmore, Conference Planning Manager, 330 West 42nd St., New York.

23–25, American Society of Mechanical Engineers, Spring Meeting, Houston. C. E. Davies, National Secretary, 29 West 39th St., New York.

APRIL

14–17, American Management Association, 12th Packaging Exposition, New York. Clap & Poliak, Inc., 232 Madison Ave., New York.

20–24, The American Foundrymen's Association, The Foundry and Allied Industries Show in conjunction with 46th Annual Convention, Cleveland. American Foundrymen's Association, 232 West Adams St., Chicago.

27–30, Chamber of Commerce of the United States of America, Annual Meeting, Washington, D. C. Ralph Bradford, Secretary, 1615 H St., N.W., Washington, D. C.

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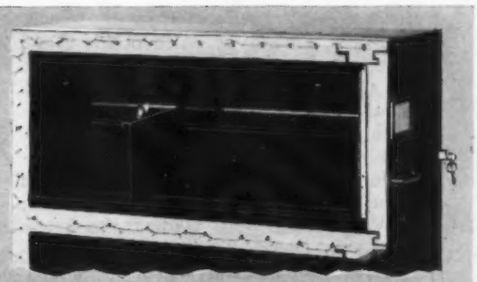

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SAFE-FILES

NATIONAL DEFENSE NEWS

Remington Rand, in cooperation with many leading defense manufacturers, has developed new methods of increasing production efficiency. This experience is available in printed, illustrated educational releases—yours for the asking! Check the ones you desire on the partial list at the right, pin to your letterhead and mail!

M. C. No. 564—Production Control—Douglas Aircraft (also Vultee, Seversky and Hamilton Standard Propeller)

S. N. No. 444A—Production Control—Spencer Lens

S. N. No. 541—Stock Control—Caterpillar Tractor

M. C. No. 605—Tool Crib Control—Two Dual Systems

S. N. No. 520—Personnel Records—Lockheed Aircraft Corp.

M. C. No. 626—Personnel Records—Remington Rand Inc.

M. C. No. 649—Technical Data Files—Warner & Swasey

M. C. No. 633—Production Control—Blackhawk Manufacturing

M. C. No. 632—Production Control—American Radiator

S. N. No. 545—Production Control—Electric Steel Foundry

S. N. No. 546—Purchasing & Production—Farnsworth Television & Radio

S. N. No. 547—Controlled "Follow-up Procedures"

S. C. No. 585—Record Protection—"Where Do You Keep Your Drawings?"

S. 768 —Systems Magazine A special 64-page "National Defense" issue—records systems and equipment.

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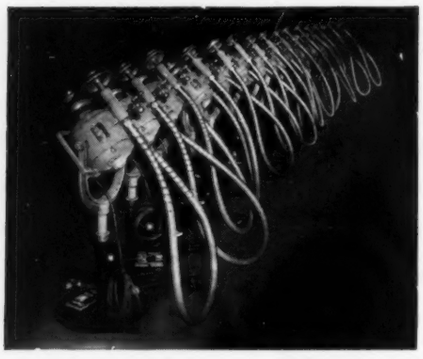

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THEY SAY AND DO

M Day Goes Unnoticed; War Plan Realized

It can now be told that Donald M. Nelson, at an off-the-record press meeting only a few months ago, was asked during the question period if there were not such a thing as the "Industrial Mobilization Plan" drawn up by the War Department for the control of productive industry on "M" Day, the theoretical first day of war.

The husky defense official cleared his throat, eyed his audience, and seemed about to deliver himself of a comprehensive answer.

"There was," he then replied succinctly, and sat down, leaving his hearers to draw their own conclusions. The nation was not yet at war. The complicated structure of emergency defense agencies did not in the least resemble the tight, streamlined, economic dictatorship which the War Department's Planning Branch had visualized in the plan they drew from World War experience—a plan quite liberally imitated in the construction of the modern German war machine.

Readers of FACTORY will recall the exposition of this plan under the title "Industry and the Next War," published in these pages in May, 1938. The Industrial Mobilization Plan visualized the centralization of all authority over production and procurement in the hands of a single War Resources Administrator, reporting directly to the President and holding affirmative sway over every agency of the government affecting the mobilization of industry for war production. This plan, drawn up in peacetime, could not, of course, foresee the slow, sidewise approach of the "next war." It contemplated a quick total effort in a sudden war. Instead America slid slowly into war with a series of experimental "defense" programs from which resulted a tangle of overlapping governmental agencies which threatened, at the time Nelson spoke, to impede production.

Weeks after Pearl Harbor, the tangle was even worse. The role of War Resources Administrator remained unfilled. In the War Department, experienced officers, including some of the authors of the Industrial Mobilization Plan, shook their heads and expressed doubt that the plan would ever be called into being, or that the President would ever delegate the needed authority to one man.

Then, on Jan. 13, came an announcement like a thunderclap, from the White House. A Presidential order called into being the War Production Board and made its chairman, this same Donald M. Nelson, the czar plenipotentiary over all productive industry and war procurement. Nelson himself drew up the Executive Order which confirms his powers. Before sending it to the White House for signature, he asked an aide what he thought of it.

"It seems to give you full authority over everything but the Pacific fleet," his assistant replied.

Nelson smiled and returned to his task. "M" Day had come and gone unnoticed, and the Industrial Mobilization Plan—as anyone who compares it with the executive order will see—became a reality. And industry prepared to hurl itself into the gigantic productive effort before it under the leadership of a hard taskmaster whom it knew to be a good friend. Nelson's first objective is to "lick Hitler and the Japs." This he believes to be the only means of saving the American private enterprise system which he reveres.

FACTORY readers may also recall this magazine's "War Communique No. 8," which, in June, 1940, observed, "Reassuring to industry is the appointment of Donald M. Nelson, of Sears, Roebuck, as Director of Procurement of the Treasury." Nelson himself told FACTORY's readers, in his signed article, "What's Ahead for Industry—and Why" (Dec. 1941):

"I have had conferred upon me an unparalleled opportunity to become one of the most unpopular men in America. I cannot see within the visible future the remotest chance that I will do anything that anybody will like."

However, he added:

"I believe in a free enterprise economy, and I believe that every day we allow to slide by, content with half measures, will endanger the ultimate survival of our free economy just that much more." Washington, where Nelson has long been regarded as the ablest man in the defense administration, was left dazed by the suddenness of the President's decision to put the IMP into effect and put Nelson at the helm. Historians may some day judge the influence of the frequent, quiet, persistent visits to the White House of Bernard M. Baruch, upon whose 1918 War Industries Board experience the IMP was modeled. Just so, historians may some day tell the details of the last-ditch fight to block the WPB executive order as it passed, in conformance to law, through the Budget Bureau on its way to the White House for signature.

•

Machine Tool Roundup in Cleveland Hall

A cooperative roundup of scattered machine tools and workers, now being staged in Cleveland, begins an experiment which, if successful, may serve as a pattern for similar programs in other cities. Mayor Frank J. Lausche has donated a huge municipal hall—built by the city to house such events as the National Metals Exhibition—as the scene of the project, and Lt.-Col. H. M. Reedall, Deputy District Ordnance Chief, estimates that the space will accommodate one thousand heavy machine tools and their operators.

Col. Reedall pointed out that the men and equipment thus brought together under one roof might otherwise face the

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STORAGE SPACE
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prospect of idleness, loss of production, and of skill, because the plants from which they come are too small or too remote to be brought into war production as subcontractors. For the city of Cleveland the plan promises a chance to mitigate priorities unemployment. For the War Department it means an opportunity to get production "in one big factory" made up of inaccessible little ones. The Cleveland Ordnance District has already faced an acute shortage of machine tools and skilled labor, and has about exhausted the number of companies able to handle subcontracting operations. The plan will give Ordnance officers a chance to centralize instruction and inspection work which might otherwise prove too costly to justify subcontracting on the machines in their original site.

Many details remained to be worked out as operators of the small plants affected began to lock up the sheds and lofts where they have been conducting their businesses. Col. Reedall expressed belief that compensation in the new pool of resources could probably be arranged on the basis of the rental of the machines at so much per working hour.

●

Rutgers "School" Teaches Sabotage Protection

New Jersey industry, a vital factor in defense production, has gone to "school" to brush up on anti-sabotage and plant protection methods.

Rutgers University was the scene of a recent two-day session, sponsored by the New Jersey Defense Council, with the support of the New Jersey Manufacturing Association, and attended by 561 representatives of 429 of the state's industrial companies. New Jersey stands third among the states in the volume of defense contracts held by its industries.

At the close of the session, Thomas Dignan, chief of staff of the State Defense Council, declared:

"We will think this school is a success if you return tomorrow and begin getting an organization together to minimize the danger of sabotage and wilful destruction."

Special Agent Joseph J. Meehan, of the Federal Bureau of Investigation, and Lester C. Thompson, of the Plant Protection Division of the New York Ordnance District of the War Department, both emphasized the importance of care in the employment and identification of workers. Meehan pointed out that "while some sabotage has been committed, no organized gangs of foreign representatives are active." But he warned that foreign agents frequently obtain employment in vital industries, purchase information from *bona fide* employees, copy or photograph confidential material, and use it to the best advantage of the powers they represent.

"Through the FBI plant survey program we believe maximum protection has been afforded against the professional saboteur," Meehan said. "But industrialists must also bear in mind that it is but a part of the work of the foreign agent to start false reports and circulate all types of rumors in order to undermine morale.

Wider Necks for production bottles

When the smooth flow from modern automatic machinery must pass through hand assembly, production miracles cease . . . and speed rests on the individual skill of men . . . and on the *fitness for the job* of every tool they work with. In countless thousands of assemblv operations througout America's vital war industries, Snap-on tools are a definite part of the picture . . . their superior speed, precision and adaptability, a measurable and important factor in eliminating waste effort and speeding up assembly. 3000 Snap-on hand and power tools are everywhere available through 35 factory branches, 550 trained representatives.

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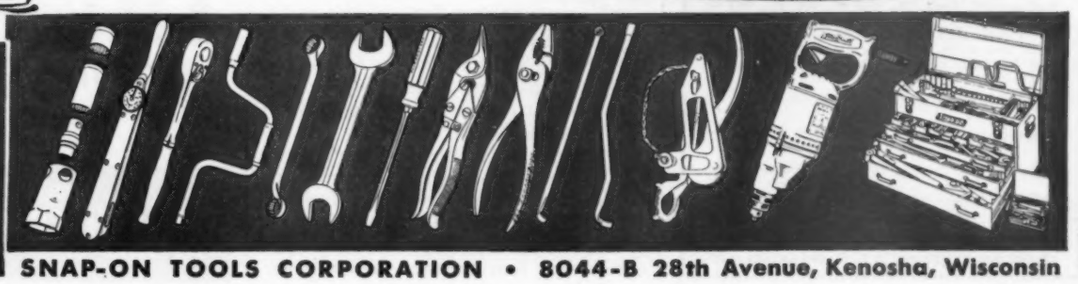

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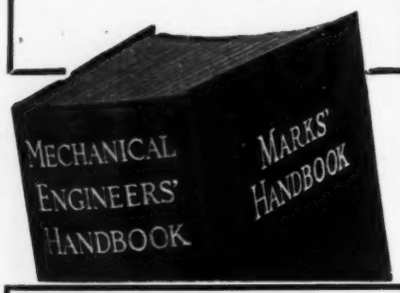

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Fear psychology will hamstring the work for national security, and I know you do not believe there is cause for such fear."

Another "teacher" was Samuel Hibben, director of lighting at the Westinghouse Electric Company, Bloomfield, and a member of the Technological Civil Protection Committee. He urged the need for "just a little plain American commonsense" in blackout defense against air raids. Hibben indicated that total blackouts were probably not necessary since the real objective of the blackout is to destroy land map patterns, which hypothetical enemy bombers might attempt to follow to an objective. Even partial blackout, he explained, eliminates identifying marks which otherwise would be visible from the sky.

"Industry," Hibben said, "should attempt to stay on the job during blackouts, and should step up its blackout program with this objective in mind." He urged the use of dim white lights during blackouts. Since "lighting must not interfere with business as usual," any order for a total industrial blackout would come "only from Army officials and in the event of a definite emergency," he said.

•

Rare Stamp Celebrates Welding's Progress

In the far away Union of South Africa a growing "arsenal of Democracy" has begun to make a little-known but important industrial contribution to Great Britain's war effort. Hence the issuance of a unique postage stamp of sixpenny value commemorating the big part which arc welding is playing in the new industrialization of South Africa.

The stamp depicts a welder using modern shielded electric arc equipment and dressed in protective headshield, gloves, and other special clothing. A collector's rarity, the stamp is printed in duplicate, both in English and in Afrikana. Officials of the Lincoln Electric Company of Cleveland have sent a number of the stamps to the attention of industrial associates in this country. It is believed this is the first time that such a stamp has been issued in the history either of stamps or welding.

•

Distillers Outdo Uncle Sam in Conversion Plans

Here's the story of an industry that is really eager to go all out for war on a basis more drastic than defense officials had planned.

When the OPM issued an order directing distilleries with industrial alcohol equipment to devote 60 percent of the production to ethyl alcohol for war purposes, the industry came right back at defense officials with a plan for converting 100 percent of their facilities to war use. Moreover, the distillers proposed the substitution of grains for molasses in producing the industrial alcohol. This would have the added advantage of freeing about one million tons of sugar, currently ear-

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CONSIDER THESE PROVEN ADVANTAGES

of Yale Pumps for Barrel-Filling, Canning, Compound Plants, Transfer Work and Specialized Applications

Yale Rotary Piston Positive Displacement Pumps, with but 3 moving parts, 2 pumping members, are *the only low pressure pumps on the market today which combine the unique advantages of variable volume and manual flow control.* In barrel-filling, as in other liquid-handling problems the trend is to Yale Pumps because they:—

1. Eliminate foaming;
2. Cut barrel-filling time of the operator;
3. Protect product being pumped by eliminating emulsification;
4. Give operators variable control over flow and pressure, unobtainable with any other pump;
5. Handle varying oils and liquids with identical efficiency, because fit of pumping members need not be changed with varying viscosities;
6. Save horsepower and reduce standby charges.

NAME YOUR PUMPING PROBLEM

If you are controlling flow to dehydrators, heaters, filters; if you are proportioning, or using automatic level controls; or handling any difficult liquid from alcohol to yeast—investigate the unique mechanical features and varied applications of Yale Rotary Piston Positive Displacement Pumps. For more efficient, economical pumping in *your* industry, write for complete details—today. The Yale & Towne Mfg. Company, 212 Henry Street, Stamford, Connecticut.

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STAMFORD, CONNECTICUT, U. S. A.

Merrily They Roll Along!

THE free movement of finished products and raw materials is one of the most important operations in any business. The easier and less troublesome the movement—the more profitable is the business.

In thousands of businesses, EWC Rubber Tired Wheels are rolling along merrily — adding to profits with every turn. EWC Rubber Tired Wheels reduce floor maintenance and repair costs — speed up materials handling with complete safety—save power—abolish noise.

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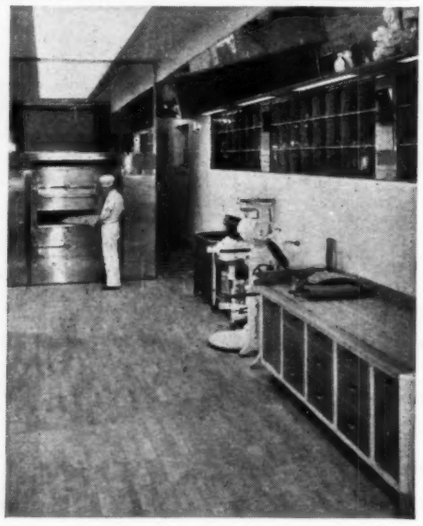
WRITE FOR LITERATURE, Prices and Suggestions.

EWC WHEELS

ELECTRIC WHEEL CO.

Dept. FA QUINCY, ILL.

Today's Trend in Industry is to *Maple Floors*



Hard Maple is getting the call today in plants from Coast to Coast.

Why? Because this comfort floor speeds up production, yet may actually cost less.

Warm and dry underfoot, it prevents loss of body warmth through conduction, adds to comfort, protects health. Resilient, it slows up fatigue, while its lasting smoothness speeds up work and traffic, to the benefit of production.

Surprisingly, though, Hard Maple usually costs no more—often, less. So tough-grained, it takes abuse without showing it; often gives many more years of service.

Today, more than ever, industry needs Hard Maple—*for faster production.* Ask your architect about **MFMA** Northern Hard Maple, in strips or blocks. See Sweet's, Sec. 11/82.

MAPLE FLOORING MANUFACTURERS ASSOCIATION

1787 McCormick Building, Chicago, Ill.

Floor *with* **MFMA** Maple

REG. U. S. PAT. OFF.

(NORTHERN HARD)

marked for alcohol, to the consumer market.

The industry's plan is actually even further ahead of the OPM's program than it appears, for the government restriction was directed only to the small minority of the industry's plants that had industrial alcohol facilities. This would have yielded only about 60,000,000 gallons of industrial alcohol a year, while the distillers' plan will produce 180,000,000 gallons.

"The grain distilling industry is willing, anxious, and patriotically desirous of supporting the war effort to the maximum," said a statement submitted with the plan by a group of leading distillers.

To U. S. tipplers, who might view this program with dismay, the OPM added a reassuring footnote: "More than five years' normal supply of whiskey has been laid away in the nation's storehouses."

•

No-Strike Pledge Filed by Chicago Union

To the management of the Acme Steel Company came, unsolicited, this resolution from its employees:

"At a time when America needs the full efficiency of everyone, it is essential that we realize what our immediate task is. The International Association of Machinists, Local 1129, went on record at the Thursday meeting of this local union of Acme Steel Company, Archer Avenue Plant, that the entire membership pledged whole-heartedly to endorse and support the act of the President and Congress in the declaration of war.

"What differences there may have been between management and the employees are now a thing of the past. We have a job to do for Uncle Sam. The union further pledges itself not to cause any stoppages of production in this plant, and the management can count on us to do our share, and more, in bringing this program to complete victory."

Multiplied by the hundreds and perhaps thousands, this incident symbolizes a wave of patriotic enthusiasm which swept the labor movement after Pearl Harbor. Typical of the sentiments of rank-and-file workers throughout the defense industries, it is the basis for the prediction that the differences between AFL and CIO may soon be resolved, removing a principal cause of labor strikes.

•

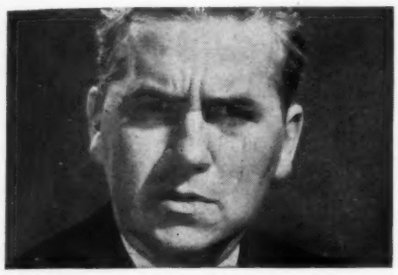
Industry Responds Promptly to New War Call

When President Roosevelt unfolded the blueprints of America's gigantic new war effort in his annual defense message, industry was prompt to respond.

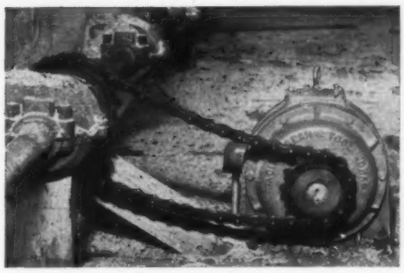
Said Henry Ford: "Given a continuous flow of materials and no interruption to labor's cooperation, the production phases of the President's program are entirely practicable. Industry can and will produce 60,000 planes, 45,000 tanks, and huge quantities of anti-aircraft guns this year. By 1943 we will have got into our stride so that stepping up this program will be

"I HEARD THAT CORROSION WAS WRECKING YOUR DRIVES," I* SAID . . .

*THE REX MAN

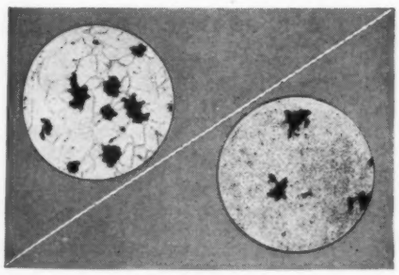


① **"HAVE YOU?"** said this worried plant engineer. "Well, you're right! We have some drives operating in pretty dusty conditions—others in moist, slightly acid conditions. The chain belts we've been using require too much servicing."



② **"YES, I KNOW,"** I said. "I was looking at them the last time I was here. Your maintenance man told me that you were having trouble with them, and immediately I knew of one chain belt that would lick both problems.

③ **"IT'S Z-METAL CHAIN BELT,"** I said. "Here are chain belts cast in all standard patterns—but cast in Z-Metal, which is as different from ordinary malleable iron as stainless is from high carbon steel. It's 25% stronger—with a higher Brinell.



④ **"THE DIFFERENCE** is shown up by these two microphotographs. Above is the structure of malleable iron—below is that of Z-Metal. Here's the reason why Z-Metal will corrode at only a fraction of the rate of malleable iron chain belts.

⑤ **"SOUNDS LIKE A GOOD ANSWER** to me, too," he said. "Even if they cost twice as much as malleable iron chain belts, Z-Metal chain belts would still be worth it if they'd eliminate delays. Can you deliver them if I were to order now?"

⑥ **"WE CAN DELIVER** chain belts faster than you think—especially as you're working on a Government contract. Give me the order now, and I'll let you know when you can expect delivery. I promise you, you'll be agreeably surprised."

Rex Z-Metal chain belts are seeing extensive service throughout industry during the current emergency—as they have in years past. Naturally, the prompt delivery of Z-Metal chain belts depend upon your priority. See your Rex Man or write 1667 West Bruce Street, Milwaukee, Wisconsin.

REX CHAIN BELTS

CHAIN BELT COMPANY OF MILWAUKEE

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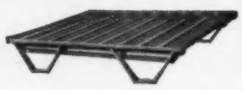
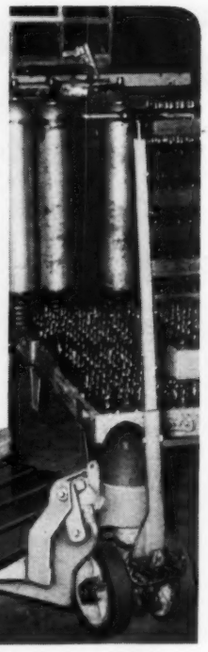
Rex Chain Belt and Conveyor Divisions, Milwaukee, Wisconsin

REX CHAIN BELT COMPANY

Skids You Won't Replace

IN A HURRY





No prophet can foretell how long equipment bought this year will have to stay on the job—so "it better be good"! But, in the case of skids, *not heavy!* By skillfully engineered corrugations or "waves" Service SteelWave Skids, all metal, are made remarkably strong for their weight. A dozen other strong points are worth writing for a circular to learn about. High spots are:

- No shrink, buckle, warp
- Splinter-free
- Heavy duty, resist jamming
- Strong but light to handle
- Flush tops, no flour pockets
- Easy maintenance

SERVICE CASTER & TRUCK CO.

Eastern Factory: 434 Somerville Ave., Somerville (Boston), Mass.
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simple. With that greater program under way the war should come to a speedy end, perhaps in 1943."

Said William P. Witherow, President of the National Association of Manufacturers: "If it's within the realm of possibility, it will be done. This is a battle of factories. American industry will do everything it can."

Said Col. John H. Jouett, President of the Aeronautical Chamber of Commerce of America: "I cannot over-emphasize the effort ahead, nor can I exaggerate the results which will be apparent within the coming months. I can say now with every assurance that the American aircraft industry, aided by upward of 50 allied industries in the United States, and this includes the great and powerful automobile industry, will produce 50,000 airplanes, including 45,000 combat craft during this calendar year; and the 125,000, including 100,000 combat planes, requested by the President for 1943."

•

U. S. Agency to Probe Job Discrimination

The President's Committee on Fair Employment Practice has announced that a letter from a disappointed job-seeker will be regarded as sufficient warrant for an investigation by the Committee of charges of discrimination by employers on grounds of race, creed, color, or national origin.

Lawrence W. Cramer, executive secretary of the Committee, explained that this ruling was made "in order that the least job-seeker, or the unemployed, might find no difficulty in having his grievance redressed."

"If primary investigations show that a firm, government agency, defense training school, or union has actually practiced the discrimination charged," the Committee announced, "and if primary contacts fail to remedy the situation, then the Committee moves to other steps which may include a public hearing, notification of other government agencies that a firm with defense contracts is endangering national unity and workers' morale by practicing discrimination in violation of government policy, or the making of representations to the President."

•

National Income Hits 95-Billion Rate

Reflecting the strong stimulus of defense production even before the war began, the level of the national income reached a rate equivalent to $95 billions a year in October. On the basis of this figure, economists are predicting that December, the first war month, will easily push the rate past the $100 billions mark.

In the first 10 months of 1941, the aggregate national income was running 17 percent higher than the same period of 1940. The most important single factor in this rise was a 21 percent increase in salaries and wages—most of which occurred in the manufacturing and commodity-producing industries where defense production has been the primary stimulus in boosting payrolls 40 percent above last year.